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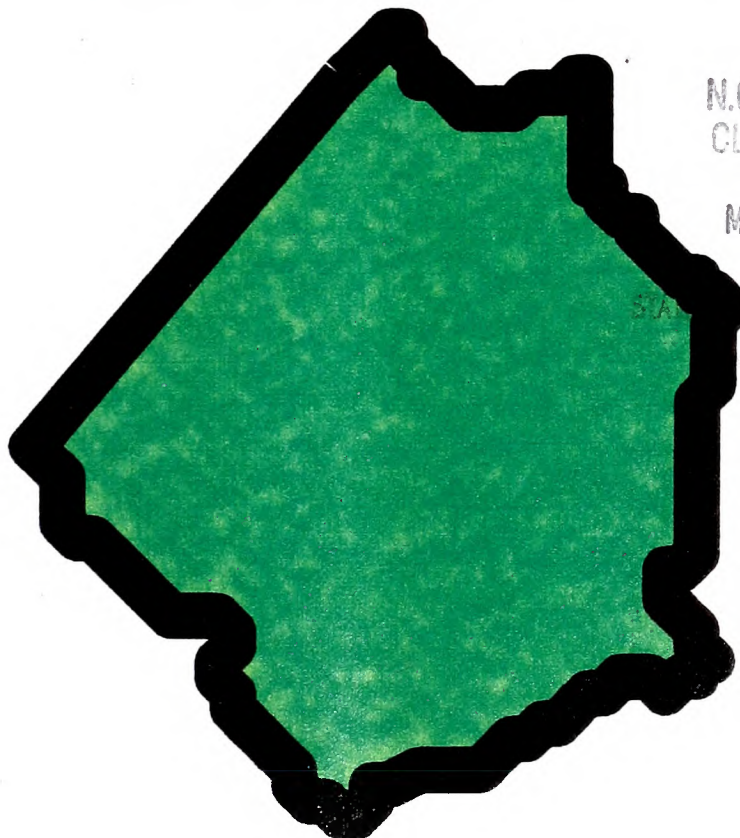


North Carolina Department of Transportation  
Statewide Planning Branch

# THOROUGHFARE PLAN REPORT

## FOR

# JOHNSTON COUNTY




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RALEIGH

March 2001





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# **Johnston County Thoroughfare Plan**

Prepared by the:

Statewide Planning Branch  
Division of Highways  
North Carolina Department of Transportation

In cooperation with:

Johnston County  
The Federal Highway Administration  
U.S. Department of Transportation

March 2001







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# Chapter 1

## *Introduction*

### **OVERVIEW**

The economic and social well being of the Johnston County depends in large measure, upon the quality of the transportation facilities that exist in the area. If people are able to travel about freely in Johnston County today and as the economy grows, then the transportation system has been planned to properly accommodate existing and future travel. A well planned transportation system will allow for economic growth, while simultaneously providing safe and efficient travel throughout the area.

Officials of Johnston County, prompted by a desire to adequately plan for future transportation needs, requested the North Carolina Department of Transportation's (NCDOT) assistance in conducting a thoroughfare plan study. The County Commissioners' primary concern was the increased development in the southwestern portion of Johnston County. A thoroughfare plan study was requested to determine the impacts of this development on the existing transportation system.

The objective of thoroughfare planning is to enable a transportation system to be progressively developed to adequately meet the transportation needs of a community, or region, as land develops and traffic volumes increase. It is essential to plan now for future transportation needs in order to avoid unnecessary costs to the physical, social, and economic environment. Thoroughfare planning is a tool that can be used by local officials to plan for future transportation needs, while at the same time reducing costs to our environment. Appendix A is a guide explaining the principles for thoroughfare planning.

The primary purpose of this report is to present the findings and recommendations of the thoroughfare plan study conducted for Johnston County. The secondary purpose of this report is to document the basic thoroughfare planning principles and procedures used in developing these recommendations. This report can be divided into five parts. The first part of the report, covered in Chapter 1, covers the highlights of the study. Chapter 2 covers the current and future problems with the Johnston County transportation system. Chapter 3 details the thoroughfare plan study recommendations, while Chapter 4 addresses different methods by which these recommendations can be implemented. The final chapter, Chapter 5, covers study procedures and public involvement.

Information that will be especially useful to the practitioners is provided in the Appendices. As previously mentioned the principles of thoroughfare planning are covered in Appendix A. A detailed tabulation of all routes on the thoroughfare plan and a graphical representation of typical cross sections can be found in Appendices B and C, respectively. Information related to model development is covered in Appendix D. Appendix E provides an index for secondary road numbers for Johnston County. Appendix F addresses the process of requesting Transportation Improvement Program Projects. Finally, Appendix G shows the information that was given to the public and the input they provided.



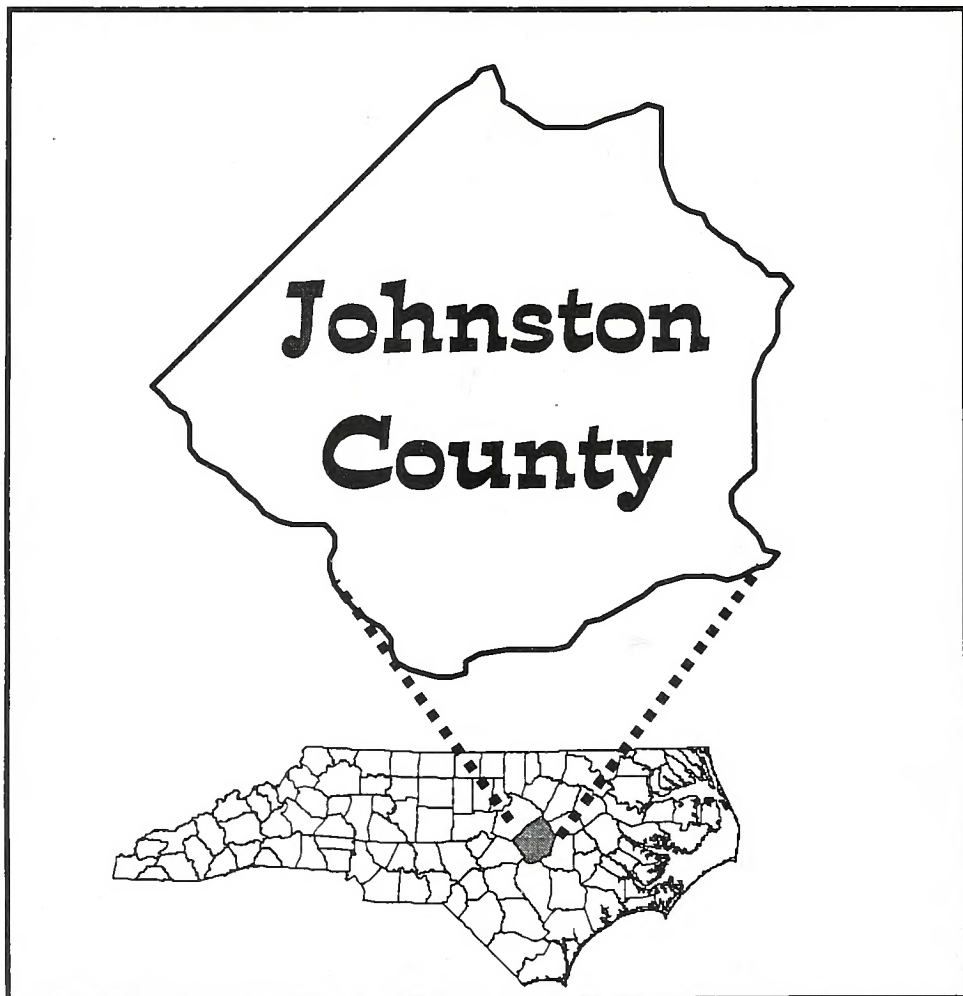
## **BRIEF HISTORY LESSON ON JOHNSTON COUNTY**

Johnston County is located in the central piedmont section of the State and is bounded by Wake, Wayne, Wilson, Harnett, Sampson, Nash and Cumberland counties. Johnston County has a total area of approximately 795 square miles. It was named for Gabriel Johnston, a former Governor of North Carolina. Johnston County was formed in 1746 from Craven County. Smithfield is the county seat. Land use in the county is primarily a mixture of agricultural, commercial, and residential development, with the majority of commercial development being in and around the county's incorporated municipalities. The western portion of the county is experiencing rapid commercial and residential growth because of its close proximity to the Triangle region and Research Triangle Park,

The major routes in Johnston County include I-40, I-95, US 70, NC 42, NC 50, US 301, US 701, NC 210, NC 96, NC 39, NC 222, and NC 231.

The geographic location for Johnston County is shown below.

**Figure 1**  
**Geographic Location for Johnston County**






## HIGHLIGHTS OF THE PLAN


Highlights of the 2000 Johnston County Thoroughfare Plan are outlined below. The recommended Thoroughfare Plan is shown in Figure 5 and the Recommended Improvements are shown in Figure 6 located in Chapter 3. Projects included in the 2001-2008 Transportation Improvement Program (TIP) are shown in parenthesis. Detailed descriptions of all the projects in the Recommended Plan for Johnston County are included in Chapter 3.


### Recommended Plan Highlights


#### US 70 Clayton Bypass(R-2552)

 4 Lane divided freeway facility on new location


#### NC 42( R-3825):

 Widen to a 4 lane divided facility from US 70 in Clayton to Buffalo Creek


 Widen to a 4 lane divided facility from I-40 to US 70 in Clayton

 Widen to a 7 lane section from I-40 to Cleveland School Road


#### Interstate 95

 Widen to a 6 lane facility throughout the County

#### SR 1010-Cleveland School Road:

 Widen to a 4 lane divided facility

#### SR 1525-Cornwallis Road:

 Widen to 3 lane curb & gutter facility

*This transportation plan is a joint effort by the North Carolina Department of Transportation and Johnston County. This plan is intended to provide Johnston County with the necessary roadway improvements to satisfy the anticipated transportation needs until the year 2025. The thoroughfare plan was developed based upon the current population, employment and travel trends in the area, as well as the anticipated growth as provided by the county staff. It is important to realize that this plan is not a rigid set of proposals, but is intended to be flexible enough to account for changes in future growth. In all likelihood, this plan will be revised approximately every 10 years in order to re-evaluate the assumptions and to eliminate any possible adverse impacts of unnecessary transportation proposals.*

Most of the improvements recommended in this report will be the responsibility of the NCDOT, but it is necessary for local officials, the local planning agency, developers and citizens of Johnston County to assist in the implementation of this transportation plan. This plan should be used as a guide to protect areas in the county where new or improved facilities may be located in the future. It should be used in conjunction with the county's land use plan, zoning regulations, and subdivision regulations in order to facilitate all types of planning that concern the County.

It is ultimately the decision of Johnston County to adhere to and follow these recommendations. Cooperation between the State and the County is of primary concern if the recommendations outlined above are to be successfully implemented. It is the responsibility of the County to



County to implement the plan following the guidelines set forth in Chapter 4. The recommended plan was not adopted by the county. Reasons are explained in Chapter 5.

It is important to note that the recommended plan is based on anticipated growth of the county as indicated by past trends and future projections. Prior to construction of projects proposed herein, a more detailed study will be required to reconsider development trends and to determine specific locations and design requirements for each project.



# Chapter 2

## *Current and Future Transportation Problems*

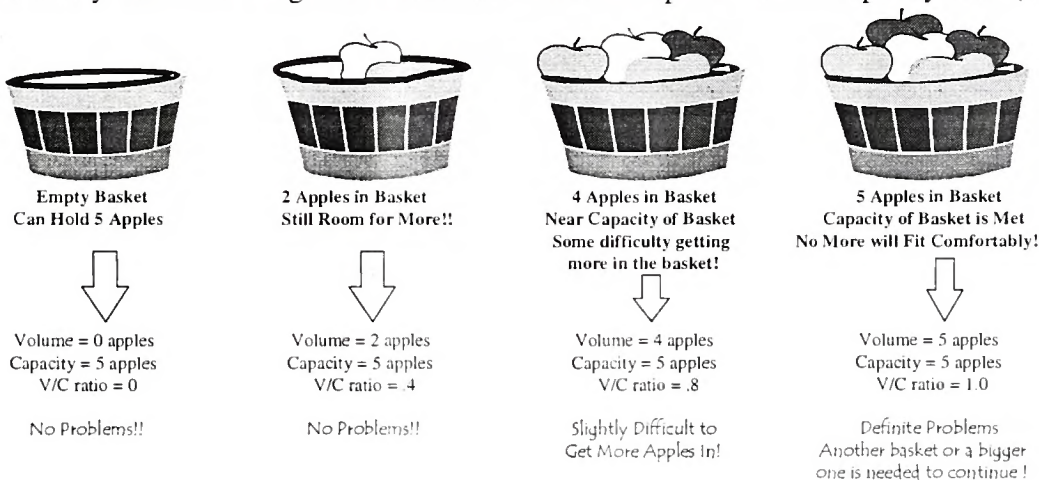


### NETWORK DEFICIENCIES

Before a recommended plan is developed for Johnston County, we must determine what traffic problems exist now or in the future. This chapter presents an analysis of the ability of the existing roadway system to serve the area's travel desires. Emphasis is placed not only on detecting the deficiencies, but also on understanding their cause. Travel deficiencies may be localized and the result of substandard highway design, inadequate pavement width, or intersection controls. Alternately, the underlying problem may be a system deficiency such as a need for a bypass, loop facility, construction of missing links, or additional radials.

Analysis of the roadway system involves examination of the existing travel patterns and identification of existing deficiencies. Roadway capacity and safety analyses are also essential in evaluating the existing transportation system. After a picture of the existing travel conditions has been developed, factors that will impact the future transportation system must be analyzed. These factors include projected population growth, economic development potential, and land use trends. This information is used to determine anticipated future deficiencies in the transportation system.

A computer model was developed to simulate the conditions in the County and to aid in evaluating the deficiencies for the area. The computer model shows the current and future traffic volumes, or number of vehicles, using primary roads in Johnston County on a daily basis. We can then compare the capacity (the number of vehicles that can travel on the road and still experience efficient travel) of each section to the number of vehicles actually using the road. If the number of vehicles using a road is almost the same or more than the number it can efficiently handle, otherwise known as the volume/capacity ratio, then we have a transportation problem, or roadway deficiency. The following cartoon illustrates the concept of volume/capacity ratio (V/C).





This apple illustration shows that as the V/C ratio gets near one you may experience some difficulty trying to put more apples in the basket. When the V/C ratio is at or above one it is overloaded and no more apples will fit without a new basket or making the existing one bigger. This is the exact same concept for traffic on roadways. If the V/C ratio is near one it makes traveling slow and not many more cars can fit on the roadway before overloading ( $V/C \geq 1.0$ ) it. When the V/C ratio is one or more for roadways, we get congestion and travelers experience discomfort in driving. We must then add a new road, widen the existing one or take some other alternative to improve the roadway capacity!

The relationship of traffic volumes to the capacity of the road determines the level of service (LOS) provided. Six levels of service have been defined, with letter designations from A to F. LOS A represents the best operating conditions and LOS F represents the worst.

The definitions of levels of service are general and conceptual in nature. Levels of service for interrupted flow, or signalized, facilities vary widely in terms of both the users perception of service quality and the operational variables used to describe them. The 1995 Highway Capacity Manual contains more detailed descriptions of the levels of service as defined for each facility type. The six levels of service, whose definitions follow, are illustrated in Figure 2.

The existing roadway network (1995) and future roadway (2020) were evaluated based on the volume to capacity ratio. The 2020 network assumes that no new roads are built and no widening of existing roads occurs. Figures 3 and 4 show the expected roadway deficiencies, or congestion problems, for 1995 & 2020. The anticipated future volumes and the current capacities of those roads are displayed. The roads that are near capacity ( $.9 < v/c < 1.0$ ) are in green and the roads over capacity ( $v/c > 1.0$ ) are in red.

There are a few deficiencies on the current network and a lot of deficiencies in the year 2020. As the deficiency map for 2020 shows, the following roads will be over capacity and not working efficiently:

- 1) Majority of NC 42
- 2) SR 1010-Cleveland School Road
- 3) Portions of I-95 & I-40
- 4) Portion of NC 210 near Interstate 40
- 5) Western portion of NC 50
- 6) Covered Bridge Road
- 7) Pritchard/Smithfield Road
- 8) Cornwallis Road



## **Levels of Service**

### **LOS A**

Describes primarily free flow conditions. Motorists experience high levels of physical and psychological comfort. The effects of minor incidents of breakdown are easily absorbed. Even at the maximum density, the average spacing between vehicles is about 528 feet, or 26 car lengths.

### **LOS B**

Represents reasonably free flow conditions. The ability to maneuver within the traffic stream is only slightly restricted. The lowest average spacing between vehicles is about 330 feet, or 18 car lengths.

### **LOS C**

Provides for stable operations, but flows approach the range in which small increases will cause substantial deterioration in service. Freedom to maneuver is noticeably restricted. Minor incidents may still be absorbed, but the local decline in service will be great. Queues may be expected to form behind any significant blockage. Minimum average spacings are in the range of 220 feet, or 11 car lengths.

### **LOS D**

Borders on unstable flow. Density begins to deteriorate somewhat more quickly with increasing flow. Small increases in flow can cause substantial deterioration in service. Freedom to maneuver is severely limited, and drivers experience drastically reduced comfort levels. Minor incidents can be expected to create substantial queuing. At the limit, vehicles are spaced at about 165 feet, or 9 car lengths.

### **LOS E**

Describes operation at capacity. Operations at this level are extremely unstable, because there are virtually no usable gaps in the traffic stream. Any disruption to the traffic stream, such as a vehicle entering from a ramp, or changing lanes, requires the following vehicles to give way to admit the vehicle. This establishes a disruption wave that propagates through the upstream traffic flow. At capacity, the traffic stream has no ability to dissipate any disruption. Any incident can be expected to produce a serious breakdown with extensive queuing. Vehicles are spaced at approximately 6 car lengths, leaving little room to maneuver.

### **LOS F**

Describes forced or breakdown flow. Such conditions generally exist within queues forming behind breakdown points.



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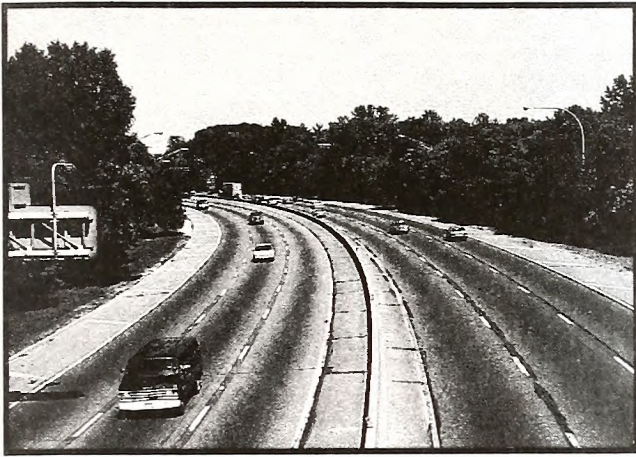
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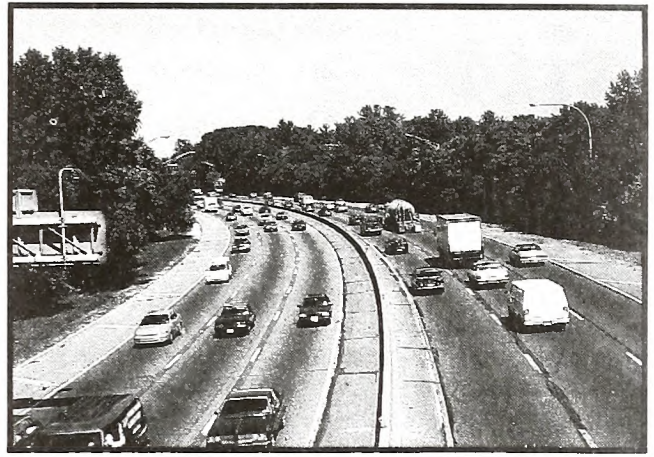
LOS 6

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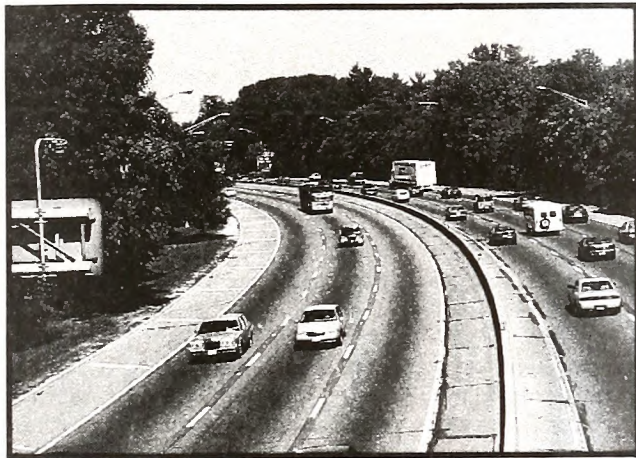




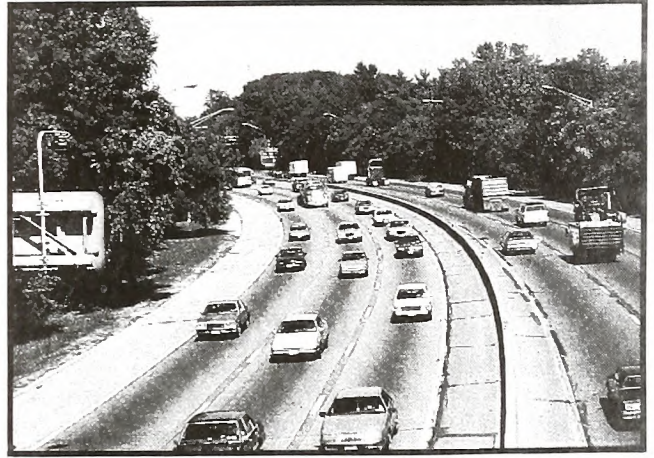
*LOS A.*



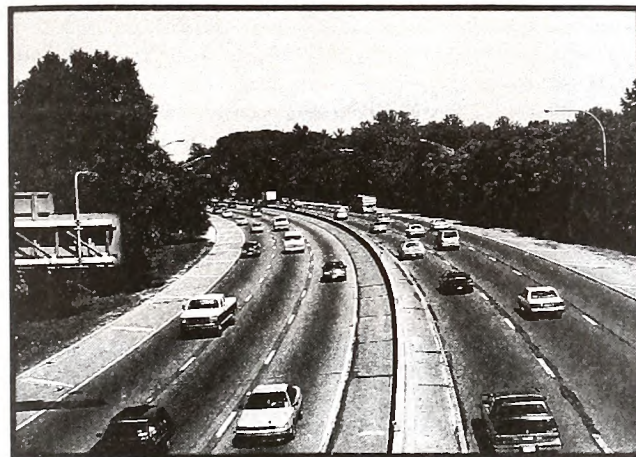
*LOS D.*



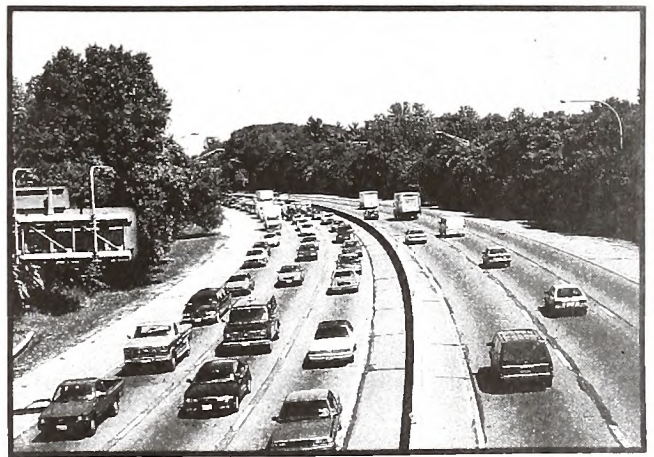
*LOS B.*



*LOS E.*



*LOS C.*



*LOS F.*

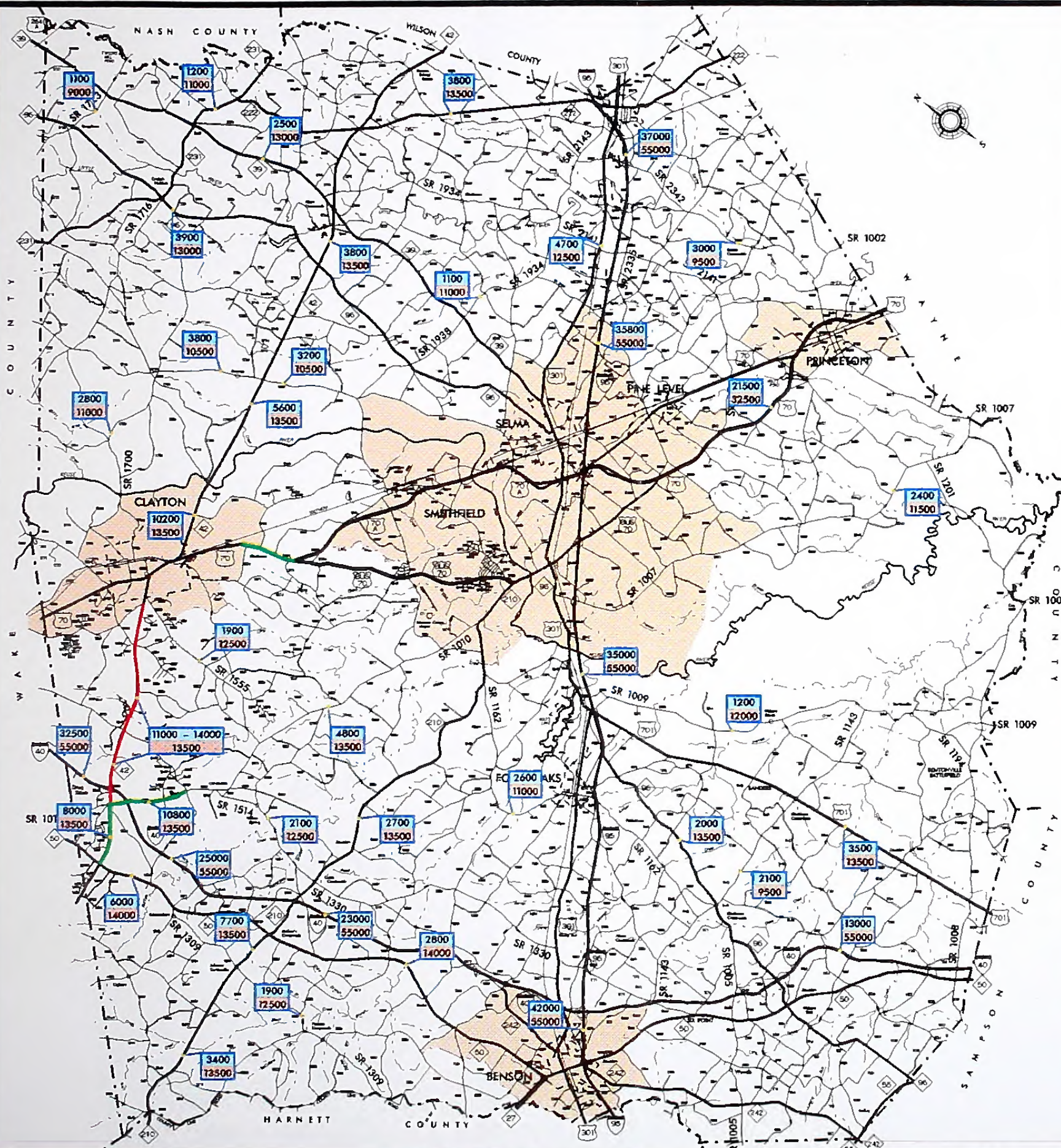
FIGURE 2

## LEVELS OF SERVICE









# LEGEND

- Over Capacity  $V/C > 1.00$
- Near Capacity  $0.85 < V/C < 1.00$
- 1995 Traffic Volume  
1995 Traffic Capacity
- Planning Area Boundary

FIGURE 3

## 1995 CAPACITY DEFICIENCIES

### JOHNSTON COUNTY NORTH CAROLINA

PREPARED BY THE  
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
STATEWIDE PLANNING BRANCH

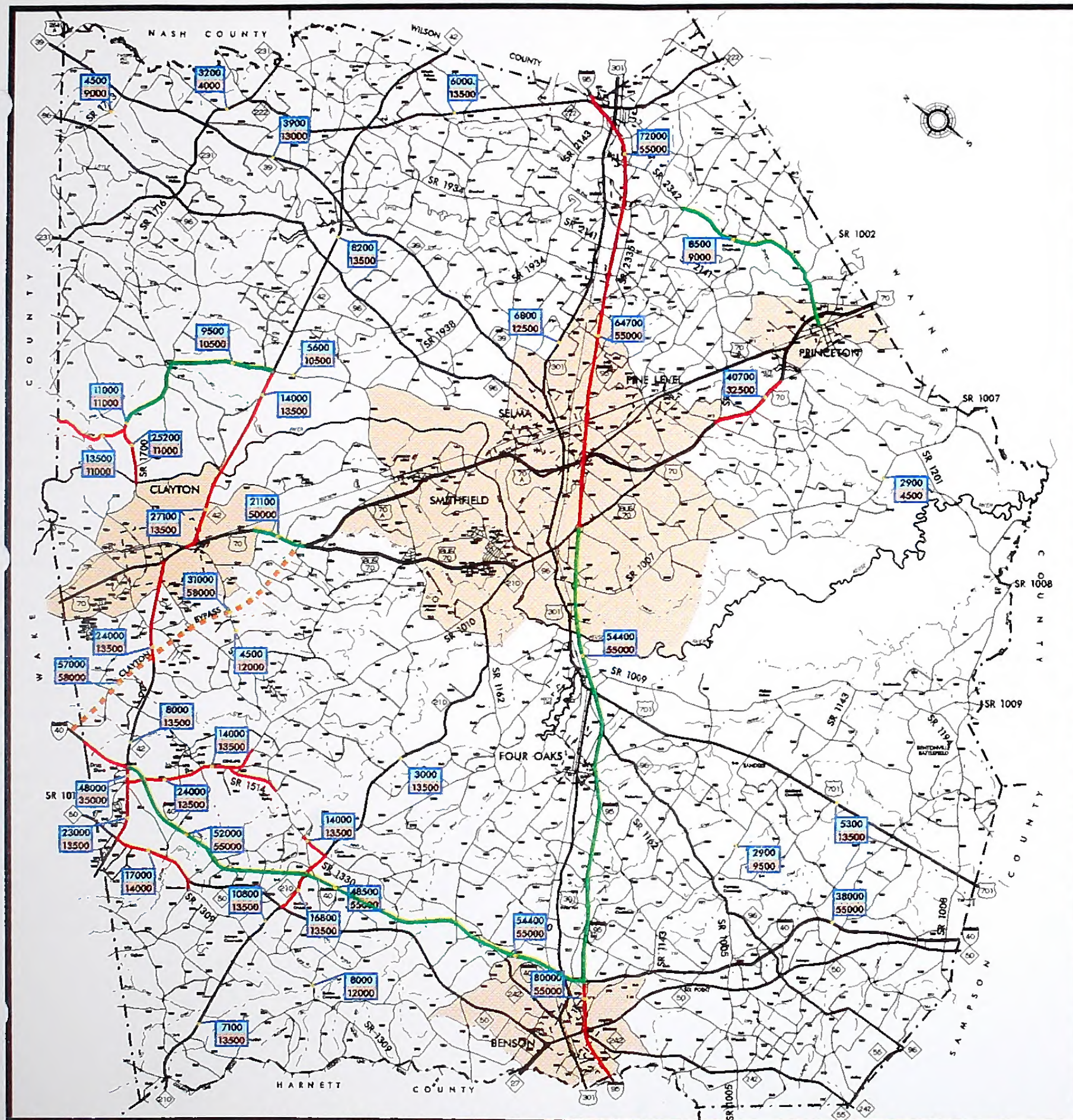
IN COOPERATION WITH THE  
U.S. DEPARTMENT OF TRANSPORTATION  
FEDERAL HIGHWAY ADMINISTRATION  
SCALES











- LEGEND**
- Over Capacity  $V/C > 1.00$
  - Near Capacity  $0.85 < V/C < 1.00$
  - 00000 2020 Traffic Volume  
00000 2020 Traffic Capacity
  - Planning Area Boundary
  - - - - Clayton Bypass

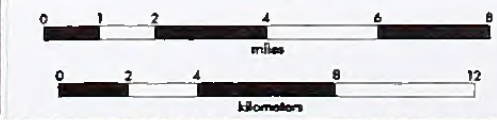
**FIGURE 4**

# 2020 CAPACITY DEFICIENCIES

**JOHNSTON COUNTY  
NORTH CAROLINA**

PREPARED BY THE  
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
STATEWIDE PLANNING BRANCH

IN COOPERATION WITH THE  
U.S. DEPARTMENT OF TRANSPORTATION  
FEDERAL HIGHWAY ADMINISTRATION  
SCALES









## TRAFFIC ACCIDENTS

The volume to capacity ratio is not the only criteria to determine what deficiencies there are in the transportation system. Traffic accident statistics can often be used as an indicator for locating congestion problems. Traffic accident records can also be reviewed to identify problem locations or deficiencies such as substandard design, inadequate signing, ineffective parking, or poor sight distance. Accident patterns identified from analysis of accident data can lead to improvements that will reduce the number of accidents.

The NCDOT Traffic Engineering and Safety Systems Branch periodically reviews accident data statewide to identify areas where accident rates may be reduced as a result of roadway improvements. The Highway Safety Improvement Program identifies the highest accident intersections so that they may be studied further. To be included in the program, each location must meet one of several warrants, or minimum criteria. For intersections, the categories of warrants are front impact crash rate, previous year crash rate, severity index levels, and night crash rate without streetlights.

Accident data is given by type in order to identify any trends that may be correctable through roadway or intersection improvements. The total number of accidents and the average accident severity are useful for ranking the most problematic intersections. The severity index is based on a series of weighting factors developed by the NCDOT. These factors define a fatal or incapacitating accident as 47.7 times more severe than one involving only property damage, and an accident resulting in minor injury as 11.8 times more severe than one with only property damage. In general, a higher severity index indicates more severe accidents. Listed below are levels of severity for various severity index ranges.

<u>Severity</u>	<u>Severity Index</u>
low	< 6.0
average	6.0 to 7.0
moderate	7.0 to 14.0
high	14.0 to 20.0
very high	> 20.0

Table 1 is a summary of the top ten intersections in Johnston County with the highest severity of accidents. Table 2 is a summary of the top seven intersections with the highest number of accidents. The criterion used to identify these locations includes 10 or more accidents within 200 feet of an intersection over a four-year period, between January 1994 and May 1998. Included in this analysis are only the rural parts of the county not the municipalities. To request a more detailed accident analysis for any of the above mentioned intersections, or other intersections of concern, the appropriate Area Traffic Engineer for Johnston County, should be contacted at (252) 237-6164. The tables provide the county with information concerning the intersections that they should seek assistance in fixing the problem associated with the intersection so that safety is improved. It is recommended that the county discuss how to improve these intersections with the Department of Transportation.



**Table 1**  
**Intersection Ranking by Total # of Crashes**

Rank	Road A	Road B	Total # of Crashes
1	I 40	NC 42	67
2	NC 42	NC 50	35
3	NC 96	SR 1934	32
4	NC 42	SR 1547	28
5	US 70B	SR 1501	27
6	NC 42	Barber Mill	24
7	NC 42	SR 1552	24
8	I 95	US 701	23
9	NC 42	SR 1525	22
10	NC 50	NC 210	22

**Table 2**  
**Intersection Ranking by Crash Severity**

Rank	Road A	Road B	Total # of Crashes	Severity Index
1	I 40	NC 210	12	23.03
2	NC 210	SR 1309	19	20.07
3	US 70B	SR 1501	19	18.03
4	NC 39	NC 42	16	17.99
5	SR 1908	SR 1913	10	13.78
6	NC 242	SR 1168	10	12.28
7	NC 42	SR 1003	27	10.73

## CONSIDERATION OF ENVIRONMENTAL FACTORS

The final piece of information that aids in determining what recommendations are made for the transportation system of an area is the location of environmental factors. Environmental issues often help determine if a road should be widened or where a new facility should be located.

In recent years, environmental considerations associated with highway improvements or construction have come to the forefront of the planning process. The legislation that dictates the necessary procedures regarding environmental impacts is the National Environmental Policy Act. Section 102 of this act requires the execution of an environmental impact statement (EIS) for road projects that have a "significant impact" on the environment. An EIS includes an evaluation of a project's impact on wetlands, water quality, historic properties, wildlife, and public lands. Although the technical report for the thoroughfare plan is not intended to cover environmental concerns in as much detail as an EIS, preliminary research on environmental factors is generally done at the thoroughfare planning stage. Therefore, the environmental factors described below are reviewed as part of the development of the EIS, making it unnecessary to conduct a detailed review



as part of this thoroughfare plan study. Once a project is funded and planning and design begins, all of these factors will have to be analyzed in detail. Consideration of the following environmental factors in the early thoroughfare planning process allows for the maximum opportunity to avoid environmentally sensitive areas when recommending improvements to the transportation system.

## **Wetlands**

In general terms, wetlands are lands where saturation with water is the dominant factor in determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. The feature that most wetlands share is soil or substrata that is at least periodically saturated with or covered by water. Water creates severe physiological problems for all plants and animals except those that are adapted for life in it or in saturated soil.

Wetlands are crucial ecosystems in our environment. They help regulate and maintain the hydrology of our rivers, lakes, and streams by slowly storing and releasing floodwaters. They help maintain the quality of our water by storing nutrients, reducing sediment loads, and reducing erosion. They are also critical to fish and wildlife populations. Wetlands provide an important habitat for about one third of the plant and animal species that are federally listed as threatened or endangered.

The impacts to wetlands can be evaluated using the National Wetlands Inventory Mapping, available from the U. S. Fish and Wildlife Service. Wetland impacts will be avoided or minimized to the greatest extent possible while preserving the integrity of the thoroughfare plan.

## **Threatened and Endangered Species**

A preliminary review of Federally Listed Threatened and Endangered Species within Johnston County was done to determine the effect transportation projects could have on wildlife. Threatened or endangered species were identified using mapping from the North Carolina Department of Environment, Health, and Natural Resources and the U.S. Fish and Wildlife database.

The Threatened and Endangered Species Act of 1973 allows the U. S. Fish and Wildlife Service to impose measures for mitigation of the environmental impacts of a road project on endangered plants and animals and critical wildlife habitats. By locating rare species in the planning stage of road construction, avoidance or minimization of these impacts is possible. Here are a few of the endangered species that have been identified in parts of Johnston County.

- \* Red-cockaded woodpecker
- \* Michaux's sumac

- \* Dwarf Wedge Mussel
- \* Tar Spiny mussel

The following website links will allow you to access the lists of all the species that have been found in Johnston County.

<http://nc-es.fws.gov/es/countyfr.html>  
<http://ncsparks.net/nhp/search.html>

A detailed field investigation of the corridor is recommended prior to construction of any highway project in this area.



## Historic Sites

The locations of historic sites in Johnston County were investigated to determine the possible impacts of the various projects studied. The federal government has issued guidelines requiring all state transportation departments to make special efforts to preserve historic sites. In addition, the State of North Carolina has issued its own guidelines for the preservation of historic sites. These two pieces of legislation are described below.

**National Historic Preservation Act** - Section 106 of this act requires state departments of transportation to identify historic properties listed in the National Register of Historic Places and properties eligible to be listed. State departments of transportation must consider the impacts of its road projects on these properties and consult with the Federal Advisory Council on Historic Preservation.

**NC General Statute 121-12(a)** - This statute requires the NCDOT to identify historic properties listed on the National Register, but not necessarily those eligible to be listed. NCDOT must consider impacts and consult with the North Carolina Historical Commission, but is not bound by their recommendations.

The State Plan for Historic Preservation was used to identify sites within Johnston County. Many of these sites are located in the municipal areas of the county. All reasonable efforts will be made to minimize the impact to identified historic sites and natural settings when widening existing roadways or constructing new facilities. A more detailed study should be done in regard to local historic sites prior to construction of any project taken to make certain that all historic sites and natural settings are preserved. Below is a list of the known historic sites in Johnston County.

Atkinson-Smith House  
Bentonville Battleground State Historic Site  
Brooklyn Historic District  
Downtown Smithfield Historic District  
Ellington-Ellis Farm  
Harper House  
Hood Brothers Building  
Johnston County Courthouse  
Nowell-Mayerburg-Oliver House  
Selma Graded School  
Stallings-Carpenter House  
Union Station

Benson Historic District  
Boyette Slave House  
Clayton Banking Company Building  
Noah Edward Edgerton House  
Hannah's Creek Primitive Baptist Ch  
Hastings-McKinnie House  
Hood-Strickland House  
North Smithfield Historic District  
Sanders-Hairr House  
William E. Smith House  
Everitt P. Stevens House

## Archaeology

There were no known significant archaeological sites discovered in the review. However, all efforts will be made to avoid or minimize any impacts to archaeological sites prior to any roadway improvements or construction. Therefore, a more detailed study should be done in regard to local historic sites prior to construction of any project. Figure 5 shows some of the environmental factors for Johnston County.

Now that the deficiencies of the roadways, the accident history and the environmental factors have been determined for the county, a recommended plan for improving the transportation system can be developed. Chapter 3 outlines the recommended plan for the Johnston County transportation system.











## Chapter 3

### *Recommended Thoroughfare Plan*

In the previous chapter we determined the specific roadways in Johnston County that would be overloaded in the future, thus creating a transportation problem. In order to fix the problems we must develop a “plan of attack”. The “plan of attack” that we develop is called Johnston County Thoroughfare Plan. The goals of the developed plan for Johnston County are to relieve traffic congestion, improve safety, air quality, promote growth and improve the overall efficiency of the transportation network.

The mutually adopted plan that will attempt to satisfy all the goals is shown in Figure 6. This plan displays all the major and minor thoroughfares (roadways) in Johnston County from 1995 to 2020, both existing and proposed. Figure 7, the recommended improvement map, displays the number of lanes and roadway widths for each of the proposed improvements. These are the recommendations of how the roads “should look” after widening or new construction is complete. These recommendations may change slightly after the actual design of the road is determined.

Appendix B is the street tabulation of each roadway in the plan. Right-of-way requirements, the length of each section, the volumes, the capacities and the cross sections are all listed in this appendix.

*The recommendations for what the roadways should “look like” and what the need is for each project are described in the remainder of this section.*

Note: \*vpd – vehicles per day



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## THOROUGHFARE PLAN RECOMMENDATIONS

The process of developing and evaluating thoroughfare plan recommendations involves many considerations, including the goals and objectives of the area, identified roadway deficiencies, environmental impacts, existing and anticipated land development, and travel services. Chapter 5 describes the public involvement that was used to develop the plan and describes the data assumptions, including population and employment estimates, that were used as a part of the study. A detailed description of the purpose and need for the recommended improvements that were cooperatively developed are described alphabetically by the letters corresponding to Figure 7. Not all the projects are listed in the same format. The higher priority facilities are listed in the first section and are in the purpose and need format. The secondary priority facilities are listed at the end of this chapter and are described through a brief narrative of the project.

### High Priority Projects

#### Project A - NC 42

**Project Recommendation:** It is recommended that this section of NC 42 be widened to a four-lane divided facility from I-40 to the southern boundary of the Town of Clayton (Ultimately to US 70). The project limits combine for a total of approximately 5.5 miles. However, this project will have limited control of access. This project is not in the 2002-2008 TIP. The estimated cost of the project is \$17 million.

- **Transportation Demand:** NC 42 is functionally classified as a major collector. This section of NC 42 serves as the primary route into Clayton from I-40 and the western portions of the county. The growth in this area will result in increased transportation demands on this two lane facility.
- **Roadway Capacity and Deficiencies:** The 1995 average daily traffic (ADT) on NC 42 ranged from 11,000 (near I-40) to 14,000 (near Clayton) vehicles per day (vpd). The 1995 traffic almost exceeds the average capacity of the road, which is approximately 13,500 vpd. The 2020 projected average daily traffic of 14,000 to 30,000 vpd will result NC 42 being over capacity throughout this section. Without any improvements, the level of service by 2020 will deteriorate to F, if traffic growth continues as expected. The proposed cross section, a four-lane divided facility, will provide capacity of approximately 35,000 vpd and will improve the level of service to B.
- **Safety Issues:** Several locations on NC 42 are high accident locations. If no improvements are made to NC 42, the resulting increase in congestion will result in the potential for increased accident rates. However, the recommended improvements to NC 42 will provide increased capacity, greater maneuverability resulting in safer driving conditions.

Due to the current lack of access control, there is a significant amount of development along several sections of NC 42. Most of the development has direct driveway access to NC 42, thus reducing the capacity of the facility and creating the increased potential for accident rates. This type of strip development is expected to continue to degrade the ability of the road to carry traffic safely and smoothly. Therefore, it is recommended that access control be implemented to the extent possible in this section. This will allow for development to occur but to only allow crossing of the entire facility at regulated locations that can be controlled through signalization or channelization.



- **Social Demands and Economic Development:** The western portion of Johnston County, which is primarily served by NC 42 and I-40, has the highest growth expectations in the county. It is anticipated that this section of NC 42 will experience extreme commercial growth because of the new bypass facility and the continued residential development in the area. In a five year span the section of NC 42 east of I-40 has added more than 35 businesses, including Lowe's, hotels, and fast food. Due to the amount of developable land in this area the residential and commercial development will increase the traffic along this corridor tremendously. It is important that control of access with the 4 lane divided facility is implemented in this section to allow for greater capacity through control of traffic movements. This section connects the Town of Clayton to the commercial area of Drug Store.
- **System Linkage:** NC 42 connects to major residential and commercial areas of Johnston County, Clayton and Drug Store. It also serves as the only northeast/southwest connection from I-40 to US 70 in the western portion of the county. These two routes are major cross state facilities in the state roadway system and the connection of these two facilities is important. When the Clayton Bypass is built this section of NC 42 will be the primary access point for people trying to access the facility from Clayton and will be a relief valve for local motorists that used to travel through town to get onto US 70 to travel to Raleigh. It is because of this connection to three major routes that this facility must operate efficiently in order to function as a complete system in this area of the county. The widening of this facility to a divided section keeps consistency for motorists traveling in the area because I-40, US 70 and the Clayton Bypass will all be divided facilities.
- **Relationship to Other Plans:** The proposed widening of this section of NC 42 ties into the Town of Clayton Thoroughfare Plan, where it is proposed to be widened from 2 lanes to 5 lanes. It also ties into the portion of NC 42 east of US 70 which is in the TIP as a multi-lane divided facility.

## Project B - NC 42

**Project Recommendation:** It is recommended that this section of NC 42 be widened to a four-lane divided facility from NE city limits of Clayton to Buffalo Creek past the intersection with Buffalo Road. The project limits combine for a total of approximately 4.39 miles. However, this project will have limited control of access. This project is R-3825 in the 2002-2008 TIP. The estimated cost of the project is \$19.3 million.

- **Transportation Demand:** NC 42 is functionally classified as a major collector. This section of NC 42 serves as the primary route into Clayton from the residential and commercial areas located northeast of Clayton. The growth in this area will result in increased transportation demands on this two lane facility. The 1995 ADT for this section ranged from 10,600 near US 70 to 5,600 at SR 1003.
- **Roadway Capacity and Deficiencies:** The 2020 projected average daily traffic of 12,000 vpd at SR 1003 to 30,000 vpd near US 70 will result in NC 42 being over capacity throughout a majority of this section. Without any improvements, the level of service by 2020 will deteriorate to E/F, if traffic growth continues as expected. The proposed cross section, a four-lane divided facility, will provide capacity of approximately 35,000 vpd and will improve the level of service and the movement of traffic in the area.



- **Safety Issues:** Several locations on NC 42 are high accident locations. The intersection of NC 42 and Buffalo Road (SR 1003) is the 7<sup>th</sup> highest severity location for accidents. If no improvements are made to NC 42, the resulting increase in congestion will result in the potential for increased accident rates. However, the recommended improvements to NC 42 will provide increased capacity, greater maneuverability, and more control of access, resulting in safer driving conditions.

Due to the current lack of access control, there is a significant amount of development along several sections of NC 42. Most of the development has direct driveway access to NC 42, thus reducing the capacity of the facility and creating the potential for increased accident rates. Therefore, it is recommended that access control be implemented to the extent possible in this section. This will allow for development to occur but to only allow crossing of the entire facility at regulated locations that can be controlled through signalization or channelization. Since a large portion of this section of NC 42 will be developed as large residential neighborhoods, a divided raised median facility will provide safe locations for children crossing this route and for limited points of conflict for turning vehicles.

- **Social Demands and Economic Development:** It is anticipated that this section of NC 42 will experience extreme residential growth over the next 20 years. There are several large developments in planning stages currently with anticipation of adding golf courses and new residential homesites totaling between 10-12,000 in this section of NC 42 over the next 20 years. There will be extensive commercial growth as well in order to support the residential growth that will occur. It is important that control of access with the 4 lane divided facility is implemented in this section to allow for greater capacity through control of traffic movements.
- **System Linkage:** This portion of NC 42 connects the large residential areas northeast of Clayton to US 70 and into Clayton. It also serves as a primary cross county route into Wilson County. This section provides access to major industry locations such as John Deere.
- **Relationship to Other Plans:** The proposed widening of this section of NC 42 ties into the Town of Clayton Thoroughfare Plan, where it is proposed to be widened from 2 lanes to 5 lanes. It also ties into the portion of NC 42 southwest of US 70 which is expected to be a multi-lane facility.

## Projects C & D - NC 42

The project information included here combines projects C & D because they serve the same purpose and need but with different cross-sections for the facility.

**Project Recommendation:** It is recommended that the section of NC 42 from I-40 to Cleveland School Road (SR 1010) be widened to a seven lane curb & gutter. The project limits combine for a total of approximately .5 miles and is estimated to cost \$1.6 million. The section from SR 1010 to NC 50 is recommended to be widened to a 5 lane curb & gutter facility. The project limits combine for a total of approximately 1.8 miles and is estimated to cost \$7.8 million. Neither project is in the 2002-2008 TIP.

- **Transportation Demand:** This section of NC 42 is functionally classified as a minor arterial. This section of NC 42 has become a default commercial area due to its proximity to I-40 and the residential growth in the western portion of the county. The 1995 ADT for this section ranged from 12,000 near I-40 to 6,000 at NC 50.



- **Roadway Capacity and Deficiencies:** The 2020 projected average daily traffic of 48,000 vpd for section C and 23,000 vpd for section D will result in NC 42 being over capacity throughout a majority of this section. The current five lane section will have to be widened in order to provide the needed capacity in this section. This will likely have to be a re-striping of the existing section to provide a mix of 11' and 12' lanes . By re-striping in the current right of way it allows for the existing businesses to remain untouched.
- **Social Demands and Economic Development:** It is anticipated that this section of NC 42 will experience extreme commercial growth over the next 20 years. From 1995 to 2000 the number of businesses grew from about 10 to approximately 150. The fast food restaurants and gas stations alone generate a lot of local traffic and through traffic using Interstate 40. This area is the primary commercial area for the entire western portion of Johnston County. The close proximity to I-40 and the fact that it is the first exit after leaving the Triangle has made this an easy stop location for travelers using I-40 to travel through the state.
- **System Linkage:** This portion of NC 42 connects the primary commercial area of the county to the large residential growth areas in the western portion of the county. It serves as a through county route and it is the main connector of the parallel north/south routes I-40 and NC 50. One of its biggest links is to Cleveland School Road (SR 1010) which serves as a primary route for residential neighborhoods and two major schools in the area. In the future this portion of NC 42 will be extremely important because the Raleigh Outer Loop has an interchange on NC 50 and this section of NC 42 will serve as the link for people to access highway 50.

## Project E -



**Project Recommendation:** It is recommended that the section of I-40 from the Johnston County Line to the NC 42 interchange be widened to six lanes. The project limits combine for a total of approximately 1.28 miles and is estimated to cost \$6.86 million. This project is not in the 2002-2008 TIP.

- **Transportation Demand:** This facility is functionally classified as an interstate. This section of I-40 is experiencing some congestion currently and after the completion of the Clayton Bypass, the Wake Outer Loop and the expected additional traffic from NC 42, this section of roadway will be at capacity. The 1995 ADT for this section was approximately 32,500 vpd with an estimate for 2020 of 80,000 vpd.
- **Roadway Capacity and Deficiencies** The current capacity of the interstate at this location is approximately 55,000. The LOS for this section of roadway would be LOS F if not widened. The widening would allow for a capacity of 100,000 vpd. The current right-of-way will be adequate for this widening.



- **Safety Issues:** The congestion that would be experienced on this portion of I40 would result in backups of exit ramps onto the interstate and NC 42. Thus presenting a safety hazard for motorists trying to travel through the area and would create an increase in accidents. It also would create unsafe travel movements between the Outer Loop and this portion of I-40. Motorists would be exiting off of the Outer Loop at a higher speed onto this congested and limited travel lane section and would have to come to an immediate slow down, creating the potential for substantially severe rear-end accidents.
- **Social Demands and Economic Development:** This section of I-40 will experience tremendous development and social demands. NC 42 is a commercially booming roadway that is on one end of this section of I-40 and on the other end (on the Wake/Johnston County line) will be the Outer Loop and the Clayton Bypass. The development potential of the surrounding land areas as a result of three major highway facilities merging together at one point is substantial. The traffic from these three facilities will be enticing to businesses and will place added stress on I40 and NC 42 as a result of motorists accessing these businesses. Since it will be easier for motorists to travel around Raleigh and Clayton because of the loop and the bypass, it is anticipated that more homes will be built in Johnston County as a result.
- **System Linkage:** I-40 is an interstate facility that connects Johnston County to the Triangle area. This portion of the interstate serves as a “local connector route” because of its tie into NC 42 in Johnston County as well as the typical interstate through county movement. This section will link together the Raleigh Outer Loop, the Clayton Bypass and NC 42 as well as I-95. All of these facilities that I-40 is linked to will serve different types of traffic and combine together to be a large portion of the vehicle miles traveled in this area. Besides US 70 in Johnston County, I40 is the only other east/west movement throughout the county and as a result is the main connection to all the areas to the west of Johnston County. This 6 lane section would keep continuity of the cross section from NC 42 into Wake County.

## **Project F – SR 1010 (Cleveland School Road)**

**Project Recommendation:** It is recommended that this section of roadway be widened to a four-lane divided facility from NC 42 to SR 1514. The project limits combine for a total of approximately 3.18 miles. However, this project will have limited control of access. This project is not in the 2002-2008 TIP. The estimated cost of the project is \$11 million.

- **Transportation Demand:** SR 1010 is functionally classified as a major collector, which primarily serves intra-county travel and traffic generators in addition to providing access to the arterial system in the western portion of the county. It is the main feeder route from the residential areas to NC 42 and I-40. The 1995 ADT was approximately 11,000 vpd with the 2020 volume anticipated to be 24,000 vpd.
- **Roadway Capacity and Deficiencies:** The 1995 traffic almost exceeds the average capacity of the road, which is approximately 13,500 vpd. The 2020 projected average daily traffic of 24,000 vpd will result in SR 1010 being over capacity throughout this section. Without any improvements, the level of service by 2020 will deteriorate to F, if traffic growth continues as expected. The proposed cross section, a four-lane divided facility, will provide capacity of approximately 35,000 vpd and will improve the level of service to B.



- **Safety Issues:** Currently, SR 1010 is not a high accident facility in the county. However, with the huge increase in residential development that is expected along this corridor, there is potential for the accident rates to increase on this facility. Due to the current lack of access control on this two lane road, there is a significant amount of development along several sections of SR 1010. Most of the development has direct driveway access to SR 1010, thus reducing the capacity of the facility and creating the potential for increased accident rates. A lot of left hand turns into/out of developments occur on this roadway and with the increase in volumes, safety becomes an issue. By widening to a 4 lane divided facility this will allow for development to occur but to only allow crossing of the entire facility at regulated locations that can be controlled through signalization or channelization.

There is also a school located on this road and this alone creates a safety problem. As the residential areas grow, the number of students using this road to walk and ride bicycles to school will increase. By widening the facility and providing sidewalks were possible, it will provide several safe havens for students on their journey to school.

- **Social Demands and Economic Development:** The western portion of Johnston County, which is primarily served by NC 42 and I-40, has the highest growth expectations in the county. The land along this facility is primarily rural residential. SR 1010 is the location where a large amount of future residential growth will occur. As a result of the residential growth this area will get the addition of schools and commercial areas as well. The aesthetic improvements to the facility, grass medians and curb and gutter, will make this area more attractive for development.
- **System Linkage:** SR 1010 is one of the primary intra-county routes. It connects Smithfield to the Drug Store area of the county. It also serves as the feeder from the neighborhood streets onto the major facilities of NC 42, NC 50 and helps connect people to Interstate 40. It is a vital connector for the educational institutions in the area.

## Project H – NC 210

**Project Recommendation:** It is recommended that this section of roadway be widened to a four-lane raised median divided facility from NC 50 to SR 1330 (Coat's Crossroads) and a three lane facility from NC 50 to SR 1309(Johnson's Crossroads). The project limits combine for a total of approximately 3.4 miles. This project is not in the 2002-2008 TIP. The estimated cost of the project is \$11.2 million.

- **Transportation Demand:** NC 210 is functionally classified as a major collector. It serves as the connection from Harnett County into Smithfield and other parts of Johnston County. It has an interchange with I-40 although currently it is not heavily developed. The two "crossroads" areas it connects are growing and the new schools in this area will increase the transportation demand on NC 210. The 1995 ADT was approximately 7,500 vpd with the 2020 volume anticipated to vary between 14,000 and 18,000 vpd.
- **Roadway Capacity and Deficiencies:** The 1995 traffic does not exceed the average capacity of the road, which is approximately 13,500 vpd. The 2020 projected average daily traffic of 18,000 vpd will result in SR 1010 being over capacity throughout this section. Without any improvements, the level of service by 2020 will deteriorate to F, if traffic growth continues as expected. The proposed cross sections will provide needed capacity and will improve the level of service.



- **Safety Issues:** NC 210 has the top two locations for accident severity. The intersection of I-40/NC 210 and NC 210/SR 1309 have severity indexes over 20 and the number of crashes totals in excess of 30 in a three year period. The close proximity of some small commercial to the exit ramps and the high speeds on a narrow facility are causes of these accidents. By widening the section close to I-40 to a 4 lane raised median divided facility(cross section E) it will allow controlling of turning of vehicles into the commercial areas of development. It will also allow for limiting the conflicts between the exit ramps and vehicles attempting to turn left into this traffic. Since there are two schools located in this area it will help provide a safe, controlled access point to the schools and reduce the conflict of buses and through traffic in the area.

The three lane section will allow for a turning storage location for vehicles attempting to cross traffic. This will help eliminate the rear end accidents along this facility and provide better movement at the intersections.

- **Social Demands and Economic Development:** As a result of the growth at the I-40 and NC 42 interchange it is anticipated that NC 210 and I-40 will grow in the future much like NC 42. Currently, there are plans for developing a large tract of land adjacent to I-40/NC 210 into a mixed use of residential and commercial. This tract will greatly influence the traffic demand on NC 210. NC 210 is relatively undeveloped and therefore offers a potential for expansion in this portion of the county. The connection of this facility with I-40 provides an easy access route into the Triangle, thus helping develop the area both residentially and commercially in the future. Improvements to this facility will further aid in the development by easing the congestion and providing a safer route of travel to motorists.
- **System Linkage:** NC 210 links Smithfield to Harnett County and provides a link to Interstate 40 as well. It is the only east/west route in this portion of the county and it provides the link between the north/south routes of I-40 and NC 50.

## Project I – NC 50

**Project Recommendation:** It is recommended that this section of roadway be widened to a three lane facility from the Wake County line to NC 210. The project limits combine for a total of approximately 6.86 miles. The estimated cost of the project is \$14.64 million.

- **Transportation Demand:** NC 50 is functionally classified as a major collector. It is a north/south route that parallels I-40. It is primarily used by motorists to enter Wake County as an alternate route to I-40. It also serves as a cross county route into Benson, connecting to I-95 and continuing on into Sampson County. The 1995 ADT ranged from 5-6,000 vpd but the 2020 volume is anticipated to be between 15-17,000 vpd.
- **Roadway Capacity and Deficiencies:** The 2020 projected average daily traffic will result in NC 50 being over capacity throughout portions of this section. The current capacity is around 13,500 vpd. The widening will provide sufficient capacity along the corridor.
- **Safety Issues:** NC 50 has two intersections along this stretch that are ranked in the top ten locations for highest number of accidents. This section of roadway has a lot of turning vehicles due to the many rural routes that connect to it and the subdivisions that exist. The widening should provide storage capacity for these vehicles and still allow for a safe and efficient movement of through vehicles. The intersections will see safety improvements due to the widening because of the turning lanes that will be provided as a result of the roadway widening.



- **Social Demands and Economic Development:** It is anticipated that over the next 20 years there will be 1100 new houses in this area. This social growth will result in a heavy demand on NC 50. Along with this residential growth goes the need for commercial areas to provide for the residential areas. New schools are also being located on or near NC 50 and this shows the tremendous social demand in this area.
- **System Linkage:** NC 50 currently exists as a local rural route between Johnston and Wake Counties. However, in the future this facility could be a major link in the Johnston County system because of the completion of the 540 Outer Loop in Wake County. NC 50 in Wake County will have an interchange with the Outer Loop and therefore it will provide a direct link for motorists in Johnston County into Raleigh and Research Triangle Park. The Widening of NC 50 in Wake County is not on the current Capital Area Metropolitan Planning Organization's transportation plan.

## **Secondary Priority Projects**

### **Project (G) - SR 1525 - Cornwallis Road**

This route primarily serves local traffic to the schools in the area and the many residences. With the turns into the residential and school facilities along this route a continuous turn lane is needed to allow for through traffic to continue through the area in an efficient manner. The current section is a 2 lane section with 10' lanes. The volumes are approximately 2500 vpd in 1995 with future volumes expected to exceed 7000 vpd. It is recommended that this be a 3 lane C & G section with additional right turn bays at the school entrances. No new ROW will be necessary for this widening.

### **Project (J) - SR 1533 - Johnson Road & Project (K) - SR 1517 - Old Sanders Road**

These two facilities are secondary roads that serve as minor connectors to NC 50 and the surrounding residential areas. Because these two facilities are currently only 2 lane roadways with 9' lanes it is recommended to widen them to the standard 12' lane sections. The wider lanes provide for safer travel conditions for motorists travelling at higher speeds on these rural routes. Since a lot of residential land use is in this area, safety for motorists should be a priority. A slight increase in ROW will be needed.

### **Project (L) - I 95**

Interstate 95 serves a wide variety of traffic in Johnston County. It is a major truck route along the east coast as well as a commuter route for motorists. Its main function is movement of vehicles & trucks through Johnston County. This facility will have a varied amount of traffic in 2020 throughout its entirety. The portion of I-95 in Benson will be way over capacity in 2020. The volumes will be around 80,000 with the current capacity of 55,000. Other portions of the facility will be near or slightly over capacity in the future. I-95 operates at a different Level of Service than most interstate facilities. Motorists travel closer together and at higher speeds than normal interstate operations. To allow for safer travel along I-95 it is recommended that I-95 be widened to 6 lanes throughout Johnston County. The ROW along this corridor is a major problem because



of the commercial growth in some areas. This project will require major ROW acquisition and will impact businesses and billboards along the facility.

#### **Project (M) - SR 2342 - College Street**

This facility is classified as a minor collector in Johnston County. Local citizens use this facility for intermediate travel from US 70 outside of Princeton to I-95 near Kenly. This facility is a N-S facility that allows local citizens to travel at high speeds without any signal stop delays. The 1995 volume is only around 3,000 vpd but is anticipated to grow near 8,000 in some areas by 2020. This facility is extremely narrow for high speed travel, 9' lanes, and as a result there have been numerous fatalities along this roadway. A high concentration of fatal accidents, 4 of them are located near the Raines Crossroads area. To allow for safer travel along this facility it is recommended to be widened to 12' lanes with some adjustments in the vertical/horizontal alignment of the roadway and the associated intersections. No additional ROW should be needed.

#### **Project (N) - SR 1560 - Ranch Road**

Ranch Road currently has a volume of traffic ranging from 1600 to 3800 vpd. With its interchange connection to the Clayton Bypass this roadway will experience an increase in traffic by the year 2020 to around 7-8,000 vpd. The 9' lanes that currently exist will not be sufficient for safety of the motorists travelling in this area. This facility may eventually be tied directly into NC 42 N of US 70 and this will increase the burden on this facility. In order to provide a direct route for motorists on SR 1010 to the Clayton bypass it is recommended that this roadway be widened to 12' lanes and an adjustment in the alignment be made. A new portion of roadway from SR 1561 to SR 1555 will have to be added and may impact some residential locations. By providing a more direct route from US 70 and SR 1010 it will help alleviate some congestion on those facilities.

#### **Project (O) - SR 1700 - Covered Bridge Road**

Currently SR 1700 is a two lane 10' lanes section. The volumes are relatively low at approximately 3,000 vpd in 1995. With the addition of 4-7,000 homes in the next 20 years and the possibility of commercial growth and three schools to support these homesteads, the traffic will balloon to 24,000 vpd in some areas. There have already been fatal crashes along this facility and the conditions will not improve with increased volumes unless the facility is widened and some horizontal alignment corrected. The development in this area would promote a aesthetically pleasing roadway section. It is recommended that this section be a 5 lane section from the Neuse River to Pritchard Road(SR 1714) and continue as a (3) three lane section to Buffalo Road (SR 1003) . The current ROW is only 60'. The 3 lane section will require no additional ROW. The 5 lane section will require a 90' ROW so a small amount of ROW will need to be acquired.

#### **Project (P) - SR 1309 - Massengill Mill Road**

There is heavy residential growth in this area and motorists use this facility as a parallel route to NC 50. A lot of neighborhoods will directly access SR 1309 and it also serves as a cross-county road in this area. To help alleviate the turning conflicts that will result from the growth in traffic a 3 lane section is recommended for this facility. It will improve safety and efficiency of traffic in this area. The current volume is around 5,000 vpd in some sections with expectations in 2020 to be near 12,000 vpd. The ROW for both sections is the same so no additional ROW will be needed.



### **Project (Q) - SR 1003 - Buffalo Road**

It is anticipated that a large tract of land along this facility will become mixed land use in the future. A few thousand homes, a golf course and some commercial will be located in this area. A majority of these facilities will provide direct access onto SR 1003 and the volumes should exceed 9,000 vpd in the near future. To allow for ease of access into these developments and to provide a safe haven for motorists turning into these developments it is recommended that a 3 lane section be placed at this location. This is also a major cross county route out of the Town of Selma, therefore it extends from the planning boundary of Selma to Covered Bridge Road (SR 1700). No additional ROW should be required to accommodate the widening.

### **Project (R) – SR 1714 – Pritchard/Smithfield Road**

Due to the expected development of a large residential neighborhood complete with businesses and schools this facility will see a large increase of traffic in the future. Other parcels are also expected to develop in the future. The volumes will be approximately 13,000 vpd. This facility will also be used as a connector to the Raleigh Outer Loop and Knightdale Bypass. This facility will have to be widened to 3 lanes to accommodate the volumes.

## **Multi-modal System**

Johnston County has a high concentration of residential locations in the western portion of the county and as a result will need to have multi-modal capabilities. Although the citizens have stated they would rather improve the highways in the area than have transit service (see Chapter 5), it is important to make that option available. The county needs to look at expansion of transit services throughout the county. Triangle Transit Authority (TTA) has future plans for route expansion of their bus service into Johnston County. Currently, the strongest transit opportunity for the citizens of Johnston County comes through vanpool. These vanpools contain riders that are entering into Wake and Durham Counties with concentrations in RTP and downtown Raleigh. Future expansion of this service will be an important part of the transportation system.

Currently, there are no official state bicycle routes in Johnston County. However, because of the growth in residential in the county and that growth's proximity to schools it is important to consider adding bicycle facilities in the county. Bicycle lanes or sidewalks along SR 1010 and Cornwallis Road would benefit the children who access the schools along these facilities. When considering the widening of the facilities in the County, the NCDOT Division of Bicycle and Pedestrian Transportation should be consulted. This division can recommend the most appropriate cross section for the widening, in addition to providing assistance in identifying the need for improvements based on present and future bicycle traffic. For further consideration and assistance, the coordinator of this division can be contacted at the address below.

NC Department of Transportation  
Division of Bicycle and Pedestrian Transportation  
P.O. Box 25201  
Raleigh, NC 27611



## **Chapter 4**

# *Implementation of the Thoroughfare Plan*

Once the thoroughfare plan has been developed and adopted, implementation is one of the most important aspects of the plan. Unless implementation is an integral part of this process, the effort and expense associated with developing the plan will be lost. There are several tools available for use by the County to assist in the implementation of the thoroughfare plan. They are described in detail in this chapter.

## **State-County Adoption of the Thoroughfare Plan**

The North Carolina Department of Transportation (NCDOT) approved the thoroughfare plan shown in Figure 6. The adopted plan now serves as a guide for the NCDOT in the development of the transportation system for the county. The approval of this plan by the County would enable standard road regulations and land use controls to be used effectively in the implementation of this plan.

## **Subdivision Controls**

Subdivision regulations require every subdivider to submit to the County Planning Board a plan of any proposed subdivision. It also requires that subdivisions be constructed to meet certain standards. Through this process, it is possible to require the subdivision streets to conform to the thoroughfare plan and to dedicate, reserve or protect necessary right-of-way for proposed roads. The construction of subdivision streets to adequate standards reduces maintenance costs and simplifies the transfer of streets to the State Highway System.

## **Land Use Controls**

Land use regulations are an important tool in that they regulate future land development and minimize undesirable development along roadways. The land use regulatory system can improve highway safety by requiring sufficient setbacks to provide for adequate sight distances and by requiring off-street parking.

## **Development Reviews**

The District Engineer's office and the Traffic Engineering Branch of NCDOT review driveway access to any state-maintained road. In addition, any development expected to generate large volumes of traffic (e.g., shopping centers, fast food restaurants, or large industries) should be comprehensively studied by the Traffic Engineering Branch and/or the Roadway Design Unit of NCDOT. If reviewed at an early stage, it is often possible to significantly improve the development's accessibility while preserving the integrity of the thoroughfare plan.



# **Funding Sources**

## **County Construction Account**

The County Construction Account is used to allocate funding to pave unimproved roads, widen roadways, stabilize dirt roads, make minor alignment improvements, and even construct short connectors when appropriate. These improvements are implemented on a priority basis that is developed through the NCDOT Division Offices. The appropriate Division Engineer's Office should be contacted for more information on the County Construction Account. The office address for Division Four, which includes Johnston County, is given below. For more specific contact information for the division office or any other NCDOT personnel, the Customer Service Office can be contacted toll free at 1-877-DOT-4YOU or by visiting the website at [www.dot.state.nc.us](http://www.dot.state.nc.us).

Division Four Engineer's Office  
N.C. Department of Transportation  
P.O. Box 3165  
Wilson, NC 27895  
(252) 237-6164

## **Transportation Improvement Program**

North Carolina's Transportation Improvement Program (TIP) is a document that lists all major transportation projects, and their funding sources, planned by the NCDOT for a seven-year period. Every two years, when the TIP is updated, completed projects are removed, programmed projects are advanced, and new projects are added. In addition to highway construction and widening, TIP funds are available for bridge replacement, highway safety projects, enhancement projects, environmental mitigation, railroad crossings, bicycle facilities, and public transportation.

During biannual TIP public hearings, municipalities, local citizens groups, and other interested parties request projects to be included in the TIP. The group requesting a particular project(s) should submit to the NCDOT Board of Transportation Member from the county's respective division the following: a letter with a prioritized summary of requested projects, TIP candidate project request forms, and project location maps with a description of each project. Refer to Appendix F for an example of a TIP project request packet. The Board of Transportation reviews all of the project requests from each area of the state. Based on the technical feasibility, need, and available funding, the board decides which projects will be included in the TIP.

## **Industrial Access Funds**

If certain economic conditions are met, Industrial Access Funds are available for construction of access roads for industries that plan to develop property that does not have access to any state-maintained road. The NCDOT Secondary Roads Office should be contacted at (919) 733-3250 for information on Industrial Access Funds.



## Small Urban Funds

Small Urban Funds are annual discretionary funds that are distributed to municipalities for qualifying projects. A given municipality may receive funding for multiple projects, but there is a maximum of one million dollars per year per division. Requests for Small Urban Fund assistance should be directed to the Division Engineer.

## The North Carolina Highway Trust Fund Law

The Highway Trust Fund Law was established in 1989 as a plan with four major goals for North Carolina's roads and highways. These goals are:

1. To complete the remaining 1,716 miles of four lane construction on the 3,600 mile North Carolina Intrastate System.
2. To construct a multilane connector in Asheville and portions of multilane loops in Charlotte, Durham, Greensboro, Raleigh, Wilmington, and Winston-Salem.
3. To supplement the secondary roads appropriation in order to pave, by 1999, 10,000 miles of unpaved secondary roads carrying 50 or more vehicles per day, and all other unpaved secondary roads by 2006.
4. To supplement the Powell Bill Program.

A portion of this bill, which will benefit Johnston County over the thirty-year planning period, is the paving of most, if not all, of its unpaved roads on the state-maintained system. The Program Development Branch of NCDOT should be contacted at (919) 733-3690 for information on the Highway Trust Fund Law.

## Implementation Recommendations

The following table gives recommendations for the most suitable funding sources and methods of implementation for the major project proposals of the Johnston County Thoroughfare Plan.

Table 3

Funding Sources and Recommended Methods of Implementation								
Projects	Funding Sources				Methods of Implementation			
	Local Funds	TIP Funds	Indust. Access	Small Urban	T-fare Plan	Subdiv. Ord.	Zoning Ord.	Develop. Review
NC 42		X			X	X	X	X
I 40		X			X			X
SR 1010		X			X	X	X	X
NC 50 & NC 210		X			X	X		X



## Construction Priorities and Cost Estimates

Construction priorities will vary depending on what criterion is considered and what weight is attached to the various criteria. Most people agree that improvements to the major thoroughfare system and major traffic routes are more important than minor thoroughfares where traffic volumes are lower. For inclusion in the North Carolina Transportation Improvement Program, a project must show favorable benefits relative to costs and should not be prohibitively disruptive to the environment.

Offsetting the benefits derived from any project is the cost of construction. A new facility, despite high projected benefits, might prove to be unjustified due to excessive right-of-way and construction costs. Construction costs are estimated by comparison to average statewide construction costs per mile for similar project types. Anticipated right-of-way costs are based on average property costs per acre for the project area. Chapter 3 gives the breakdown of the total project costs for the major project proposals of the Johnston County Thoroughfare Plan.

Reduced user cost should result from any roadway improvement, from simple widening to construction of a new roadway. Roadway improvements should also relieve congested or unsafe conditions. Comparisons of the existing and the proposed facilities are made in terms of vehicle operating costs, travel time costs, and accident costs. These user benefits are computed as total dollar savings, over the thirty-year design period, using data such as project length, base year and design year traffic volumes, traffic speed, type of facility, and volume to capacity ratio.

The prioritization for these projects is the responsibility of the County. The elected officials along with input from the citizens should determine which projects will achieve the goals and objectives that are presented in Chapter 5 and therefore prioritize them accordingly.



## Chapter 5

### *How the Plan was Developed*

In previous chapters of this report the Thoroughfare Plan and the recommendations for what Johnston County's transportation system should look like in the future were presented. The development of these recommendations is based off of the transportation demand on the system, the goals and objectives of the citizens of Johnston County and the elected officials in the area.

This chapter briefly describes how, through the use of a transportation model, the transportation demand was determined and how the public was involved in the decisions of the plan.

#### **DEVELOPING THE MODEL**

In order to look at the future traffic demand in Johnston County, a computer model was developed to simulate what might occur on the roadway system in the year 2020. This computer model uses the local housing and employment data to estimate how many trips people in the county make on a daily basis. Once we know how many trips people are making in the county, we can put this information into the computer model to determine which roadways they will use to make these trips. By assigning the trips (or cars & trucks) to certain roadways we can evaluate what roads will need to be improved in the future. The years that were used to evaluate the transportation demand in Johnston County were 1995 and 2020. Appendix D describes some of the data input into the model.

#### ***Base Year Data (1995)***

The base year or year in which the model simulates the existing conditions in the county is 1995. The data for the base year was collected through GIS data for the county. The Johnston County GIS Department and the County Tax Office provided information from their databases for the year 1995. The tax office provided a text file with all the parcel information in the county. This file has data such as parcel numbers, house value, land type(residential or business), type of house on the parcel or type of business on the parcel. The GIS department provided Arcview files that display every parcel in the county and contains the acreage of the parcel, the ID number and the parcel owner. These two databases were merged together in order to collect the housing and employment information for the entire county. Each parcel was placed into either the residential or business category based on the type of parcel it was. The parcels that were businesses were then grouped by type of business and entered into the computer as input data into the model. A field check of all the employment centers in the county was done to determine the exact number of employees for each business.



The parcels that were determined to be residential were then broken into three housing classification categories: Above Average, Average and Below Average. The classification of the housing units into these three areas allowed for the number of trips by each house to be determined by the model. The county economic development and planning departments helped to determine the three housing classifications based on value of the house on the property. Table 4 below summarizes the classification breakdown of housing in the county based on these three categories. The classification describes the category the house was placed in. The range of house value shows the value that was used from the parcel database to determine what type of house was on each land parcel in the county. The trips per household shows how many trips are made on a daily basis by each type of household and the last column is a total number of houses in the county for each type of household. The number of persons per household was 2.50 in the 1995 base year.

**Table 4 – 1995 Johnston County Housing Classification**

Classification	Range of House Value	Total Houses in the County
Above Average	> 80,000	6137
Average	40-80,000	18815
Below Average	< 40,000	13047

- Note: A portion of the houses in the area were used as special generators.
- See Appendix D for details.

This data is then used in the computer to simulate the number of vehicles using the roads in Johnston County in 1995. The numbers assigned to each road by the computer is compared to actual traffic counts taken in the county to make sure that the model is accurately reflecting what is occurring on the transportation system in 1995. The base year is then used to determine what will happen in the future by projecting the housing and employment information into the future. That is described in the next section.

### ***Future Year Data (2020)***

The future year data is forecasted using growth trends and other planning factors for Johnston County. The Office of State Planning numbers are used for a basis of comparison as well as the County's Land Use Plan, developed by Benchmark, Inc. After consultation with Benchmark and the planning department, the decision is to use an overall growth rate of about 2.43%. The actual breakdown of the anticipated growth was 2.75% for 12 years and then a lower growth rate of 2.01% for the remaining years to account for the population stabilizing. By applying these percentages to the base year population of 95,000 the anticipated population in 2020 is approximately 173,000. With the anticipated persons per household at 2.25 the number of houses expected in the year 2020 is 76,900. The 1995 housing numbers and the future housing numbers for the municipalities in the county (Smithfield, Clayton, Princeton, Benson) have to be subtracted from this total. The total number of new houses anticipated in the 25 year



period is approximately 27,800. The employment numbers were developed by THE County planning staff and Benchmark using various planning factors. The total number of employees anticipated in 2020 is approximately 45,000. Adding about 19,000 new jobs in the county.

The County Planning Department allocated the houses and employees throughout the county based on their knowledge of the land use, the location of new schools, and anticipation of new development proposals. These projections were a joint effort by the County, the State and the consultant Benchmark, Inc. and were approved by the Johnston County Planning Board.

As previously stated, all of this data is used in the model to determine future deficiencies in the network as described in Chapter 2 of this document. In order to determine how to solve these deficiencies, recommend a plan (Chapter 3), the public is involved to help make these decisions. The next section describes how this was accomplished.

## **PUBLIC INVOLVEMENT**

There are two categories in which public involvement was used for the Johnston County Transportation plan: (1) Citizens and (2) Elected Officials. Some of the items used to involve both groups in the decision making process overlap, while others are targeted for a particular group. This section summarizes the involvement of these two groups in the planning process.

In an initial attempt to get the public and elected officials into the planning process a goals and objectives survey was given to people throughout the county. This survey is used to gather the opinions of people about how they want roads to develop in the county, how they feel about the environmental issues in transportation, and the importance of various issues to them. This survey allows for guidance when planning improvements to the transportation system. Figure 8 shows the Goals and Objectives survey that was developed. This survey was sent out in the newspaper as an insert and was left at schools around the county, as well as given to elected officials. 5000 surveys were sent out and over 500 were received back. A 10% response rate is considered good so this gives a representative sample of people's opinion throughout the county. Based on the results of the survey, most of the people favored widening existing roads instead of creating new ones or leaving it congested. The survey resulted helped the elected officials and the NCDOT staff decide that widenings were more important to the people than new roads and the survey also helped justify why some of the projects were needed. The results of the survey are displayed in Appendix G.

One major public involvement step was the public drop-in session that was held in November 1999. This public session displayed the recommended thoroughfare plan, the recommendations map, provided information as to what the planning process was about(see Appendix G) and allowed people to ask questions about projects of concern or give ideas about how to improve the plan. A questionnaire was handed out to each



person who attended and this was used to get public approval of the plan. The responses were very supportive of the plan and the direction of the transportation system in Johnston County. The drop-in session was advertised in the local papers. The survey and some of the responses are displayed in Appendix G.

The elected officials in the county were involved in the process through several types of meetings. The Johnston County Planning Board had 6 presentations about the data going into the model, the deficiencies in the plan, and the recommendations for the transportation plan in the county. There were also several small working group sessions in which officials in the county got to together to discuss the recommendations on a road by road basis in detail. These ideas were incorporated into the plan. The county Comprehensive Plan Committee also got involved through a series of presentations and working groups. The response at these sessions were overwhelming and produced great ideas and results for the Johnston County plan.

The proposed thoroughfare plan was never adopted by the County Commissioners because of the unsuccessful attempt to get on the agenda. The County Planning Director did not respond to numerous attempts by NCDOT to place this item on the agenda. The County Manager was also contacted about this situation and NCDOT still received no input or feedback on adopting the plan. It was decided that the development of this plan had gone long enough and that the adoption would no longer be pursued by the Department.

These different types of public involvement were combined together to aid in the recommended plan that was discussed in Chapter 3. Without the input of citizens and officials in Johnston County this plan would not have been successful.



# JOHNSTON COUNTY TRANSPORTATION GOALS SURVEY

A thoroughfare plan study is being completed by the North Carolina Department of Transportation in cooperation with the Johnston County Planning Department. The development of a thoroughfare plan involves studying the existing roadway system throughout the county, looking for places where there are traffic problems now or possibly in the future, and deciding on ways to solve these transportation problems. Thoroughfare planning will provide public officials with a tool that can be used in the development of a roadway system that will best meet the current and future travel desires.

In order to understand what issues are important to the people in Johnston County this survey has been developed to allow citizens to give their opinion regarding what should be done to the transportation system in the area. Your opinions are important to local officials and the Department of Transportation and will be used while developing the thoroughfare plan for Johnston County.

Please rank each group of items in order of importance. (Use each number only once)

RANK THE ISSUES THAT SHOULD BE CONSIDERED WHEN DEVELOPING A THOROUGHFARE PLAN  
(1 is most important, 5 is least important): USE EACH NUMBER ONLY ONCE

- Environmental preservation
- Individual home or business preservation
- Community preservation
- New economic development growth
- Community enhancements such as better roads, quiet neighborhoods, pedestrian trails, bike trails, etc.

RANK HOW A ROAD'S ABILITY TO CARRY TRAFFIC SHOULD BE INCREASED  
(1 is most important, 5 is least important): USE EACH NUMBER ONLY ONCE

- By making improvements to the intersections
- By building additional travel lanes
- By controlling strip development
- By encouraging people to ride together or to use public transportation

If a 2 lane road in Johnston County is congested (crowded by vehicles), what would you like to see done to improve the traffic conditions? (Circle One)

Add More Lanes  
(Widen It)

Construct a New Road to  
Provide Another Path of Travel

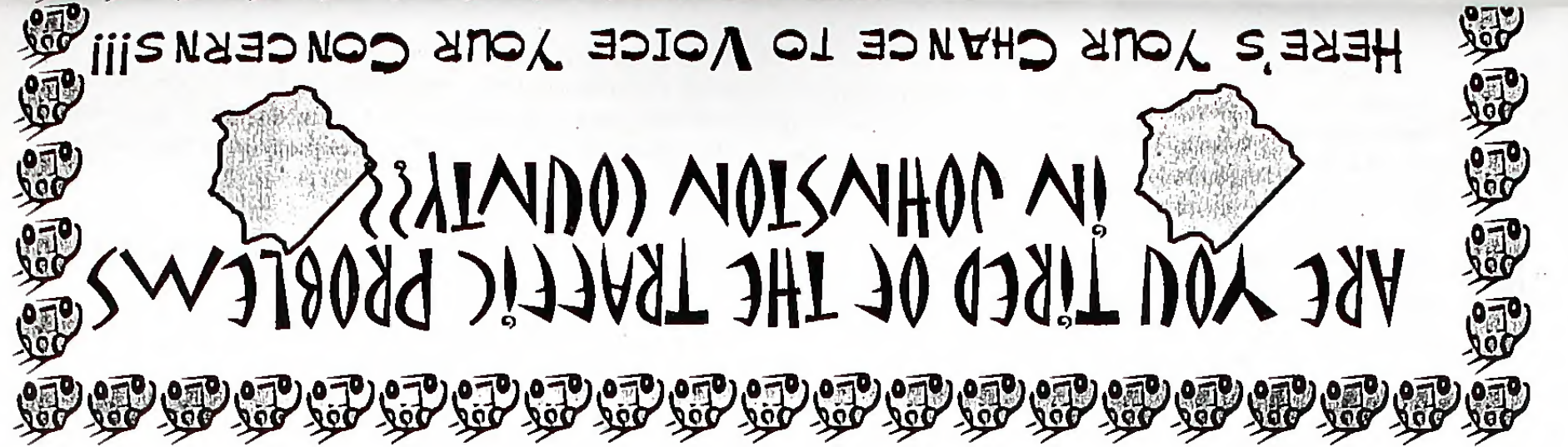
Don't Do Anything  
(Just Put Up With the Traffic)

Please Indicate How Important Each of These Topics Are to You by Placing a ✓ in the Appropriate Box

	Not Important	Undecided (Neutral)	Somewhat Important	Very Important		Not Important	Undecided (Neutral)	Somewhat Important	Very Important
Reduce Air/Noise Pollution	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Limiting Numbers of Commercial Drive-ways Along Roads	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Transportation Impacts on the Environment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Improve Roads to Attract Industry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bicycle Routes/Lanes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Connecting Existing Streets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sidewalks & Greenways	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Minimize Highway Construction Costs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Protecting Natural Areas/Open Spaces	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Increase Road Widths for More Comfortable Travel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Preserve Land for Future Roads	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Paving Existing Soil Roads	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Protecting Homes/Industry along Roads	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Providing Multiple Entrances /Exits into Neighborhoods	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Develop New Roads to Relieve Congestion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Adding More Traffic Signals to Existing Roads	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reducing Accidents	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	School Travel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Access to Shopping Centers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
Travel Time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					

PLEASE RETURN COMPLETED SURVEY BY MAY 29





# ARE YOU TIRED OF THE TRAFFIC PROBLEMS IN JOHNSTON COUNTY??

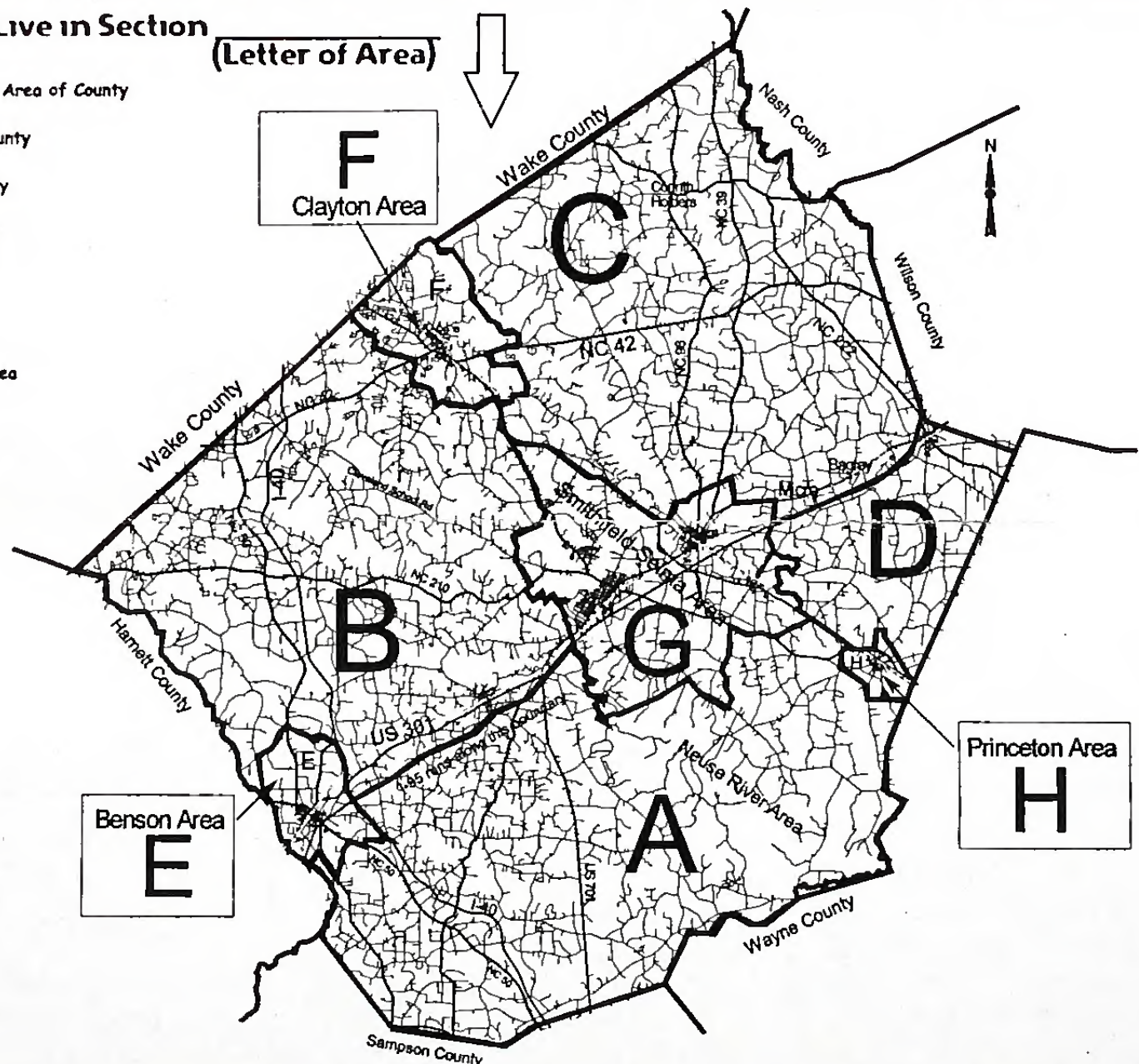
HERE'S YOUR CHANCE TO VOICE YOUR CONCERNS!!!

## WHERE DO YOU LIVE IN JOHNSTON COUNTY??

Determine Approximately Where You Live on the Map. Write the LETTER in the Space Provided !

I Live in Section (Letter of Area)

- A = Southern/Southeast Area of County
- B = Western Area of County
- C = North Area of County
- D = East Area of County
- E = Benson Area
- F = Clayton Area
- G = Smithfield-Selma Area
- H = Princeton Area



If Traffic Congestion (A lot of cars on the road moving at a slow pace) is a Problem in Johnston County, List the Three (3) Streets or Intersections that are the Worst in Your Opinion!

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_



PLEASE TELL US HOW YOU RECEIVED THIS SURVEY?

- ☐ Received in the Mail
- ☐ Picked Up at the County Courthouse
- ☐ Picked Up at Local School
- ☐ From a Friend/Relative

When You have completed this survey please return it to the Johnston County Planning Department Office by dropping it off at the planning office building or place in an envelope and mail to:

JOHNSTON COUNTY PLANNING DEPARTMENT  
(TRANSPORTATION SURVEY)  
P. O. Box 1864  
SMITHFIELD, NC 27577

Additional Comments May Be Attached to this Survey

PLEASE RETURN COMPLETED SURVEY BY MAY 29

PLEASE RETURN COMPLETED SURVEY BY MAY 29



# Appendix A







# **Appendix A**

## **Thoroughfare Planning Principles**

There are many advantages to thoroughfare planning, but the primary objective is to assure that the road system will be progressively developed to serve future travel desires. Thus, the main consideration in thoroughfare planning is to make provisions for street and highway improvements so that, when the need arises, feasible opportunities to make improvements exist.

### **Benefits of Thoroughfare Planning**

There are two major benefits derived from thoroughfare planning. First, each road is designed to perform a specific function and provide a specific level of service. This permits savings in right-of-way, construction, and maintenance costs. It also protects residential neighborhoods and encourages stability in travel and land use patterns. Second, thoroughfare planning allows local officials to be informed of future improvements and enables them to incorporate this information into planning and policy decisions. This permits developers to design subdivisions in a non-conflicting manner, enables school and park officials to better locate their facilities, and minimizes the damage to property values and community appearance that could otherwise be associated with roadway improvements.

### **County Thoroughfare Planning Concepts**

The purpose of thoroughfare planning is to provide a functional roadway system that permits direct, efficient, and safe travel. Different elements in the system are designed to have specific functions and levels of service, thus minimizing the traffic and land service conflict.

In a county thoroughfare plan, elements are either urban or rural. In an urban planning area, the local municipality generally has planning jurisdiction. Outside the urban planning area, the county has planning jurisdiction.

Within both urban and rural systems, transportation elements are classified according to the specific function they are designed to perform. A discussion of the elements and functions of the two systems follows.

### **Thoroughfare Classification Systems**

Roads perform two primary functions, traffic service and land access. These functions can be served effectively when both traffic volumes and demand to access land are low. However, when traffic volumes are high, conflicts created by uncontrolled and intensely developed abutting property may lead to intolerable traffic flow friction and congestion.

The underlying concept of a thoroughfare plan is that it provides a functional system of roads that permits travel from origins to destinations with directness, ease, and safety. Different roads in this



The underlying concept of a thoroughfare plan is that it provides a functional system of roads that permits travel from origins to destinations with directness, ease, and safety. Different roads in this system are designed to perform specific functions, thus minimizing the conflict between traffic service and land access.

## **Urban Classification**

For urban thoroughfare plans, roadways are classified as major thoroughfares, minor thoroughfares, or local access streets.

### **Major Thoroughfares**

These routes are the primary traffic arteries of the urban area and they accommodate traffic movements within, around, and through the area.

### **Minor Thoroughfares**

Roadways classified as this type collect traffic from the local access streets and carry it to the major thoroughfare system.

### **Local Access Streets**

This classification includes all streets that have a primary purpose of providing access to the abutting property. This category is further classified as either residential, commercial and/or industrial, depending upon the type of land use that is served.

Due to the limited amount of detail that can be shown on a county thoroughfare plan, only urban major thoroughfares are shown.

## **Rural Classification**

A rural classification system is used for county thoroughfare plans, which also show the major thoroughfares within urban thoroughfare planning boundaries. There are four major systems in the rural classification system: principal arterials, minor arterials, major and minor collectors, and local roads.

### **Rural Principal Arterial System**

The principal arterial system is a connected network of continuous routes that serve corridor movements having substantial statewide or interstate travel characteristics. Longer trip lengths and greater travel densities characterize this type of travel. The principal arterial system should serve all urban areas of over 50,000 in population and most of those with a population greater than 5,000. The interstate system constitutes a significant portion of the principal arterial system.

### **Rural Minor Arterial System**

The minor arterial system forms a network that links cities, large towns, and other major traffic generators, such as large resorts. The minor arterial system generally serves intrastate and intercounty travel and travel corridors with trip lengths and travel densities somewhat less than the principal arterial system.



## **Rural Collector Road System**

The rural collector routes generally serve intracounty travel. These routes serve travel whose distances are shorter than on the arterial routes. The rural collector road system is subclassified into major and minor collector roads.

### *Major Collector Roads*

These routes provide service to most sizable towns not directly served by the higher systems and to other traffic generators of equivalent intracounty importance, such as consolidated schools, shipping points, county parks, significant mining and agricultural areas, etc. Major collector roads also link these places to routes of higher classification and serve the more important intracounty travel corridors.

### *Minor Collector Roads*

These roads collect traffic from local roads and provide a link within a reasonable distance to a major collector road. Minor collectors also provide service to the remaining smaller communities and link rural areas to the locally important traffic generators.

## **Rural Local Road System**

The local road system consists of all facilities not on a higher system. Local residential streets and residential collector streets are elements of this system. Facilities designated as local residential streets are either cul-de-sacs, loop streets less than 2,500 feet in length, or streets less than one mile in length. These streets do not connect thoroughfares or serve major traffic generators and do not collect traffic from more than one hundred dwelling units. Residential collector streets serve as the connecting street system between local residential streets and the thoroughfare system.

The functional classification for Johnston County is shown in Figure A-1.















# Objectives of Thoroughfare Planning

Thoroughfare planning is the process public officials use to assure the development of the most appropriate roadway system to meet existing and future travel desires within the urban area or county. The primary aim of a thoroughfare plan is to guide the development of the roadway system in a manner consistent with changing traffic patterns. Thoroughfare planning enables road improvements to be made as traffic demands increase and ensure only needed improvements are implemented, eliminating the expense of unnecessary projects. By developing the roadway system to keep pace with increasing traffic demands, maximum utilization of the system can be attained, requiring a minimum amount of land for transportation purposes. In addition to providing for traffic needs, urban thoroughfare plans should embody those details of good urban planning necessary to present a pleasing and efficient urban community. The present and future population dispersion, as well as commercial and industrial development, affect major street and highway locations. Conversely, the location of major streets and highways within a given area influences the local development pattern.

Objectives of a thoroughfare plan include:

- To provide for the orderly development of an adequate major roadway system as land development occurs;
- To reduce travel and transportation costs;
- To reduce the cost of major roadway improvements to the public through the coordination of the roadway system with private action;
- To enable private interest to plan their actions, improvements, and development with full knowledge of public intent;
- To minimize disruption and displacement of people and businesses through long range advance planning for major roadway improvements;
- To reduce environmental impacts, such as air pollution, resulting from transportation, and
- To increase travel safety.

These objectives are achieved through improving both the operational efficiency of thoroughfares, and improving the system efficiency through system coordination and layout.

## Operational Efficiency

The operational efficiency of a road is improved by increasing the capability of the street to carry more vehicular traffic and people. In terms of vehicular traffic, a road's capacity is defined by the maximum number of vehicles that can pass a given point on a road during a given time period under prevailing roadway and traffic conditions. Capacity is affected by the physical features of the roadway, prevailing traffic characteristics, and weather.



Physical ways to improve vehicular capacity include:

- **Roadway widening** - Widening of a road from two to four lanes more than doubles the capacity of the road by providing additional maneuverability for traffic.
- **Intersection improvements** - Increasing the turning radii, adding exclusive turn lanes, and channelizing movements can improve the capacity of an existing intersection.
- **Improving vertical and horizontal alignment** - Alignment improvements reduce congestion caused by slow moving vehicles.
- **Eliminating roadside obstacles** - Improving lateral clearance reduces side friction and improves a driver's field of sight.

Operational ways to improve a road's capacity include:

- **Control of Access** - A roadway with complete access control can often carry three times the traffic handled by a non-controlled access road with identical width and number of lanes.(Used in Clayton Bypass project)
- **Parking removal** - Capacity is increased by providing additional roadway width for traffic flow and reducing friction to flow caused by parking and unparking vehicles.(not considered applicable in plan)
- **One-way operation** - The capacity of a street can be increased by 20 -50%, depending upon turning movements and overall street width, by initiating one-way traffic operations. One-way streets can also improve traffic flow by decreasing potential traffic conflicts and simplifying traffic signal coordination.(not considered applicable in plan)
- **Reversible lanes** - Reversible traffic lanes may be used to increase street capacity in situations where heavy directional flows occur during peak periods.(not considered applicable in plan)
- **Signal phasing and coordination** - Uncoordinated signals and poor signal phasing restrict traffic flow by creating excessive stop-and-go operation.(not considered applicable in plan)

Altering travel demand is a third way to improve the efficiency of existing streets. Travel demand can be reduced in the following ways:

- **Carpools** - Encouraging the formation of carpools and vanpools for journeys to work and other trip purposes reduces the number of vehicles on the roadway and raises the people carrying capability of the street system.
- **Alternate mode** - Encouragement of transit and bicycle use reduces vehicular congestion.
- **Work hours** - Programs by industries, businesses, and institutions to stagger work hours or establish variable work hours for employees spreads peak travel over a longer time period and thus reduces peak hour demand.
- **Land use** - Planning land use can control development or redevelopment in a more travel efficient manner.



## **System Efficiency**

Another means for altering travel demand on existing facilities is the development of a more efficient system of roads that will better serve travel desires. A more efficient transportation system can reduce travel distances, time, and user costs. Improvements in system efficiency can be achieved through the concept of functional classification of roads and development of a coordinated major street system.

## **Application of Thoroughfare Planning Principles**

The concepts presented in the discussion of thoroughfare classification systems, operational efficiency and system efficiency, are conceptual tools available to aid in developing a thoroughfare plan. However, in practice thoroughfare planning is done for established urban areas or counties and is constrained by existing land use and street patterns, existing public attitudes and goals, and current expectations of future land use. Compromises must be made because of these and the many other factors that affect road locations.

Through the thoroughfare planning process it is necessary, from a practical viewpoint, that certain basic principles be followed as closely as possible. These principles are listed below.

1. The plan should be derived from a thorough knowledge of existing travel - its component parts, and the factors that contribute to it, limit it, and modify it.
2. Traffic demands must be sufficient to warrant the designation and development of each facility. The thoroughfare plan should be designed to accommodate a large portion of major traffic movements on a few roads.
3. The plan should conform to and provide for the land development plan for the area.
4. Certain considerations must be given to development beyond the current planning period. Particularly in outlying or sparsely developed areas that have development potential, it is necessary to designate thoroughfares on a long-range planning basis to protect rights-of-way for future thoroughfare development.
5. While being consistent with the above principles and realistic in terms of travel trends, the thoroughfare plan must be economically feasible.







# Appendix B







# **Appendix B**

## **Thoroughfare Plan Street Tabulation and Recommendations**

This appendix includes a detailed tabulation of all roads identified as elements of the Johnston County Thoroughfare Plan. The table includes a description of the roads by sections, as well as the length, cross section, and right-of-way for each section. Also included are the existing and projected average daily traffic volumes, the practical roadway capacity, and the recommended ultimate lane configuration. The practical capacity for the roads in this plan are based on a level of service D. Due to space constraints, the recommended cross-sections are given in the following form: number of lanes/ alphabetic code. A detailed description and illustrative figure for each of the alphabetic codes for cross sections can be found in Appendix C.

The future ADT's are based on the entire plan being in place in the year 2020.

The following index of terms may be helpful in interpreting the table:

ADQ – Adequate  
Co. – County  
DIST – Distance  
EXIST. – Existing  
N/A – Not Available  
No. – Number  
REC. – Recommended  
RDWY – Roadway  
ROW – Right-of-Way  
VPD – Vehicles Per Day







## Appendix - B

## Street Appendix for County Areas(Functionally Classified Only)

Facility & Segment from to			Existing Conditions (1995)						Future Conditions (2020)	
			Distance (mi)	Roadway		Current ROW (1995) (ft)	Practical Capacity (vpd)	1995 ADT (vpd)	Rec X-section ADQ = adequate	Estimated 2020 ADT (vpd)
				(ft)	lanes					
<b>I-95</b>										
	Wilson CO.	Exit 107/US301	1.39	48	4	328	50,000	35,000	D	61,000
		Exit 107/US301								
		Exit 106/SR2399	0.99	48	4	228	50,000	41,000	D	65,000
		Exit 106/SR2399								
		Exit 105/SR2339	1.69	48	4	228	50,000	40,000	D	68,000
		Exit 105/SR2339								
		Exit 102/SR2130	2.08	48	4	228	50,000	39,000	D	72,000
		Exit 102/SR2130								
		Exit 98/SR2137	1.19	48	4	228	50,000	39,000	D	72,000
		Exit 98/SR2137								
		Exit 98/SR1927	1.79	48	4	228	50,000	39,000	D	70,000
		Exit 98/SR1927								
		Exit 97/US 70BY	1.19	48	4	258	50,000	39,000	D	68,000
		Exit 97/US 70BY								
		Exit 95/US 70BU	1.98	48	4	258	50,000	37,000	D	60,000
		Exit 95/US 70BU								
		Exit 93/SR1007	1.79	48	4	258	50,000	39,000	D	50,000
		Exit 93/SR1007								
		Exit 90/US701	3.08	48	4	281	50,000	38,000	D	54,000
		Exit 90/US701								
		Exit 87/SR1178	1.98	48	4	278	50,000	34,000	D	50,000
		Exit 87/SR1178								
		Exit I-40	6.35	48	4	231	50,000	33,000	D	52,000
		Exit I-40								
		Exit 79/NC 50	1.49	48	4	189	50,000	45,000	D	80,000
		Exit 79/NC 50								
		Harnett CO.	1.59	48	4	189	50,000	42,000	D	72,000
<b>I 40</b>										
	Wake CO.	NC 42	1.69	48	4	231	50,000	30,000	D	60,000
		NC 42								
		NC 210	6.84	48	4	231	50,000	32,000	ADQ	50,000
		NC 210								
		NC 242	6.75	48	4	251	50,000	28,000	ADQ	48,000
		NC 242								
		I-95	2.08	48	4	251	50,000	26,000	ADQ	52,000
		I-95								
		Harnett CO.	11.80	48	4	301	50,000	16,000	ADQ	37,000
<b>US 70</b>										
	SR 1901	US 70 BUS	1.98	48	4	202	54,000	27,000	ADQ	21,000
	SR 2141	SR 2522	2.69	66	4	251	54,000	18,000	ADQ	40,000
<b>US 301</b>										
	Wilson CO.	I-95	1.13	48	6	241		12,000	ADQ	21,000
	I-95	SR 2137	4.66	48	4	241		6,000	ADQ	14,000
	Neuse River	US 701	1.94	48	2	241		8,000	ADQ	11,000
	US 701	SR 1162	2.43	48	2	241		6,500	ADQ	10,000
	SR 1162	I 40	6.26	48	2	241		2,000	ADQ	4,500
<b>NC 242</b>										
	Sampson Co.	City Limits	8.48	22	2	60	12500	1,900	ADQ	4,000
	SR 1380	I-40	0.35	24	2	100	13500	4,500	ADQ	11,000
<b>NC 96</b>										
	Sampson Co.	NC 50	4.47	18	2	60	9500	800	ADQ	2,400
	NC 50	I-40	1.15	18	2	60	9500	1,400	ADQ	3,600
	I-40	I 95	8.70	24	2	150	13500	1,100	ADQ	2,500
	City Limits Selma	NC 42	7.27	30	2	60	13500	1,800	ADQ	4,100
	NC 42	Wake Co.	18.41	24	2	60	13500	1,700	ADQ	3,700
<b>NC 50</b>										
	NCL Benson	NC 210	6.12	28	2	100	13500	2,800	ADQ	6,000
	NC 210	NC42	5.63	28	2	100	14000	4,100	ADQ	17,000
	NC 42	Wake Co.	0.86	28	2	100	13500	2,000	ADQ	4,200
<b>US 701</b>										
	Sampson Co.	I-95	12.88	30	2	100	13500	3,000	ADQ	6,200
<b>SR1107</b>										
	Harnett Co.	SR 1005	2.00	20	2	60	11500	900	ADQ	2,000
<b>SR 1005</b>										
	SR 1107	NC 96	6.25	18	2	100	9500	600	ADQ	1,700
<b>SR1143</b>										
	NC 50	SR 1009	11.90	20	2	50	11500	1,100	ADQ	2,700
<b>SR 1009</b>										
	US 701	Wayne Co.	12.90	22	2	60	12500	500	ADQ	3,000
<b>SR 1008</b>										
	NC 50	US 701	0.52	20	2	150	11500	1,500	ADQ	3,200
	US 701	SR 1200	11.08	20	2	40	11500	600	ADQ	1,200



## Street Appendix for County Areas(Functionally Classified Only)

Facility & Segment from to			Existing Conditions (1995)						Future Conditions (2020)	
			Distance (mi)	Roadway		Current ROW (1995) (ft)	Practical Capacity (vpd)	1995 ADT (vpd)	Rec X-section ADQ = adequate	Estimated 2020 ADT (vpd)
				(ft)	lanes					
SR 1201	SR 1007	SR 1008	5.30	20	2	60	11500	600	ADQ	1,300
SR 1007	US 301	Wayne Co.	13.74	20	2	150	9500	900	ADQ	2,500
SR 1162	NC 210	NCL F. Oaks	5.70	20	2	60	11500	1,800	ADQ	4,500
	SCL F. Oaks	SR 1143	4.57	20	2	60	11500	1,000	ADQ	2,600
SR 2141	US 70	SR 1934	9.28	20	2	60	11500	800	ADQ	3,500
SR 2309	NCL Pine Level	SCL Pine Level	3.01	20	2	60	9500	1,400	ADQ	3,500
	SCL Pine Level	SR 1007	4.54	20	2	60	11500	600	ADQ	2,300
SR 1001	SR 2335	SR 2309	1.10	20	2	100	11500	250	ADQ	1,700
SR 1938	SR 1003	SR 1934	6.00	20	2	60	11500	1,200	ADQ	2,400
SR 1934	NC 222	SR 1938	9.37	20	2	60	11500	1,400	ADQ	2,800
SR 2143	SR 1934	Wilson Co.	3.92	20	2	60	11500	700	ADQ	1,600
SR 2342	SR 1002	SCL Kenly	8.18	18	2	60	9500	1,200	K	6,000
	SCL Kenly	NC 222	0.45	18	2	60	7500	1,400	K	4,000
NC 222	NC 42	NCL Kenly	11.00	24	2	100	13500	2,100	ADQ	5,800
	SCL Kenly	Wayne Co.	2.62	24	2	60	13500	1,500	ADQ	2,500
SR 2105	Nash Co.	NC 42	1.80	20	2	60	11500	600	ADQ	1,300
SR 1002	Wayne Co.	NCL Prince	3.00	20	2	50	11500	3,000	ADQ	7,000
SR 1330	SR 1510	NC 210	10.91	24	2	60	13500	3,000	ADQ	12,000
	NC 210	US 301	10.91	24	2	60	13500	600	ADQ	1,400
SR 1514	SR 1010	SR 1510	1.30	22	2	60	12500	1,500	ADQ	9,800
SR 1517	SR 1330	NC 50	3.70	18	2	60	9500	700	ADQ	2,500
SR 1533	NC 50	Wake Co.	3.40	18	2	60	9500	1,200	ADQ	2,900
SR 1309	SR 1533	Harnett Co.	8.10	22	2	60	12500	1,600	ADQ	6,000
NC 210	Harnett Co.	SR 1309	2.37	24	2	60	13500	3,400	ADQ	7,100
	SR 1309	NC 50	4.05	24	2	100	13500	7,700	H	16,000
	NC 50	SR 1330	1.76	24	2	60	13500	3,400	F	17,000
	SR 1330	WCL Smithfield	9.01	24	2	50	13500	2,900	ADQ	4,000
SR 1010	NC 210	SR 1514	12.12	24	2	60	13500	4,800	ADQ	7,000
	SR 1514	NC 42	1.68	24	2	100	13500	11,000	F	24,000
SR 1525	SR 1524	Wake Co.	8.10	20	2	50	11500	1,800	H	10,000
SR 1560	SR 1561	US 70	2.95	18	2	60	9500	2,000	K	5,000
NC 42	NC 50	SR 1525	1.79	24	2	100	13500	8,000	C	23,000
	SR 1525	I40	0.44	24	2	100	13500	16,000	B	48,000
	I40	Clayton Byp	3.44	24	2	100	13500	13,000	F	10,000
	Clayton Byp	W Clayton Boundary	2.01	24	2	100	13500	13,000	F	24,000



Street Appendix for County Areas(Functionally Classified Only)

			Existing Conditions (1995)						Future Conditions (2020)	
Facility & Segment			Distance	Roadway		Current ROW (1995)	Practical Capacity	1995 ADT	Rec X-section	Estimated 2020 ADT
from	to		(mi)	(ft)	lanes	(ft)	(vpd)	(vpd)	ADQ = adequate	(vpd)
SR 1003	E Clayton Boundary	SR 1003	4.45	24	2	100	13500	5,800	F	27,000
	SR 1003	Wilson Co.	11.53	24	2	100	13500	3,800	ADQ	8,200
NC 39	NCL Selma	SR 1701	6.13	20	2	50	11500	3,500	H	9,500
	SR 1701	Wake Co.	3.82	20	2	50	11500	2,400	ADQ	5,000
SR 1700	US 301	Wake Co.	21.78	24	2	60	13500	2,500	ADQ	4,500
SR 1723	Neuse River	SR 1003	4.31	20	2	60	11500	2,800	C & H	12,000
	SR 1003	NC 231	5.04	20	2	60	11500	3,800	ADQ	5,500
NC 231	Nash Co.	Wake Co.	3.60	18	2	60	9500	1,100	ADQ	4,500
	Wake Co.	Nash Co.	9.62	20	2	60	11500	1,200	ADQ	3,200







# Appendix C







# Appendix C

## Typical Thoroughfare Cross Sections

Cross section requirements for thoroughfares vary according to the desired capacity and level of service to be provided. Universal standards in the design of thoroughfares are not practical. Each roadway section must be individually analyzed and its cross section determined based on the volume and type of projected traffic, existing capacity, desired level of service, and available right-of-way. Based on this criteria, recommended typical cross-sections are given in Appendix B, Table B-1. Typical cross section recommendations are shown in Figure C-1. These cross sections are typical for facilities on new location and where right-of-way constraints are not critical. For widening projects and urban projects with limited right-of-way, special cross sections should be developed that meet the needs of the project.

On all existing and proposed major thoroughfares delineated on the thoroughfare plan, adequate right-of-way should be protected or acquired for the recommended cross sections. In addition to cross-section and right-of-way recommendations for improvements, Table B-1 may recommend ultimate needed right-of-way for the following situations:

- thoroughfares which may require widening after the current planning period,
- thoroughfares which are borderline adequate and accelerated traffic growth could render them deficient, and
- thoroughfares where an urban curb and gutter cross section may be locally desirable because of urban development or redevelopment.

Recommended design standards relating to grades, sight distances, degree of curve, super elevation, and other considerations for thoroughfares are given in Appendix D. The typical cross sections are described below.

### **A - Four Lanes Divided with Median - Freeway**

Cross-section "A" is typical for four lane divided highways in rural areas that may have only partial or no control of access. The minimum median width for this cross section is 46 feet, but a wider median is desirable.

### **B - Seven Lanes - Curb & Gutter**

Cross section "B" is typically not recommended for new projects. When the conditions warrant six lanes, cross section "D" should be recommended. Cross section "B" should be used only in special situations such as when widening from a five-lane section and right-of-way is limited. Even in these situations, consideration should be given to converting the center turn lane to a median so that cross section "D" is the final cross section.

### **C - Five Lanes - Curb & Gutter**

Typical for major thoroughfares, cross section "C" is desirable where frequent left turns are anticipated as a result of abutting development or frequent street intersections.



#### **D - Six Lanes Divided with Raised Median - Curb & Gutter/ E - Four Lanes Divided with Raised Median - Curb and Gutter**

Cross sections "D" and "E" are typically used on major thoroughfares where left turns and intersection streets are not as frequent. Left turns would be restricted to a few selected intersections. The 16 ft median is the minimum recommended for an urban boulevard type cross section. In most instances, monolithic construction should be utilized due to greater cost effectiveness, ease and speed of placement, and reduced future maintenance requirements. In special cases, grassed or landscaped medians result in greatly increased maintenance costs and an increase in danger to maintenance personnel. Non-monolithic medians should only be recommended when the above concerns are addressed.

#### **F - Four Lanes Divided - Boulevard, Grass Median**

Cross-section "F" is typically recommended for urban boulevards or parkways to enhance the urban environment and to improve the compatibility of major thoroughfares with residential areas. A minimum median width of 24 ft is recommended with 30 ft being desirable.

#### **G - Four Lanes - Curb & Gutter**

Cross section "G" is recommended for major thoroughfares where projected travel indicates a need for four travel lanes but traffic is not excessively high, left turning movements are light, and right-of-way is restricted. An additional left turn lane would probably be required at major intersections. This cross section should be used only if the above criteria is met. If right-of-way is not restricted, future strip development could take place and the inner lanes could become de facto left turn lanes.

#### **H - Three Lanes - Curb & Gutter**

In urban environments, thoroughfares which are proposed to function as one-way traffic carriers would typically require cross section "H".

#### **I - Two Lanes - C&G, Parking both sides: J - Two Lanes - C&G, Parking one side**

Cross sections "I" and "J" are usually recommended for urban minor thoroughfares since these facilities usually serve both land service and traffic service functions. Cross section "I" would be used on those minor thoroughfares where parking on both sides is needed as a result of more intense development.

#### **K - Two Lanes - Paved Shoulder**

Cross section "K" is used in rural areas or for staged construction of a wider multi-lane cross section. On some thoroughfares, projected traffic volumes may indicate that two travel lanes will adequately serve travel for a considerable period of time. For areas that are growing and future widening will be necessary, the full right-of-way of 100 ft should be required. In some instances, local ordinances may not allow the full 100 ft. In those cases, 70 ft should be preserved with the understanding that the full 70 ft will be preserved by use of building setbacks and future street line ordinances.



### **L - Six Lanes Divided with Grass Median - Freeway**

Cross section "L" is typical for controlled access freeways. The 46 ft grassed median is the minimum desirable median width, but there could be some variation from this depending upon design considerations. Right-of-way requirements would typically vary upward from 228 ft depending upon cut and fill requirements.

### **M - Eight Lanes Divided with Raised Median - Curb & Gutter**

Also used for controlled access freeways, cross section "M" may be recommended for freeways going through major urban areas or for routes projected to carry very high volumes of traffic.

### **N - Five Lanes/C&G, Widened Curb Lanes; O - Two Lane/Shoulder Section; P - Four Lanes Divided/Raised Median, C&G, Widened Curb Lanes**

If there is sufficient bicycle travel along the thoroughfare to justify a bicycle lane or bikeway, additional right-of-way may be required to contain the bicycle facilities. The North Carolina Bicycle Facilities Planning and Design Guidelines should be consulted for design standards for bicycle facilities. Cross sections "N", "O", and "P" are typically used to accommodate bicycle travel.

### **General**

The urban curb and gutter cross sections all illustrate the sidewalk adjacent to the curb with a buffer or utility strip between the sidewalk and the minimum right-of-way line. This permits adequate setback for utility poles. If it is desired to move the sidewalk farther away from the street to provide additional separation for pedestrians or for aesthetic reasons, additional right-of-way must be provided to insure adequate setback for utility poles.

The right-of-way shown for each typical cross section is the minimum amount required to contain the street, sidewalks, utilities, and drainage facilities. Cut and fill requirements may require either additional right-of-way or construction easements. Obtaining construction easements is becoming the more common practice for urban thoroughfare construction.







# TYPICAL THOROUGHFARE CROSS SECTIONS

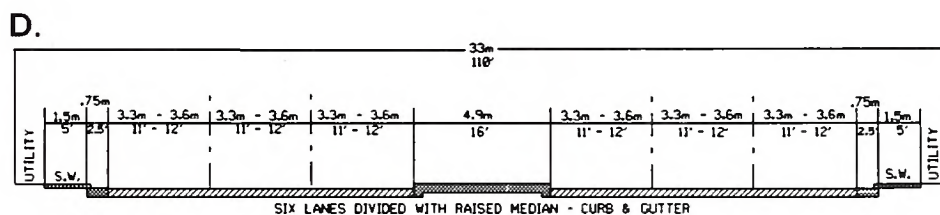
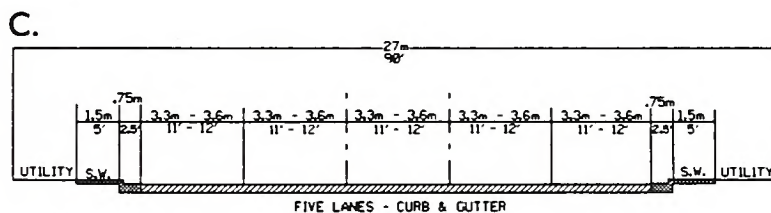
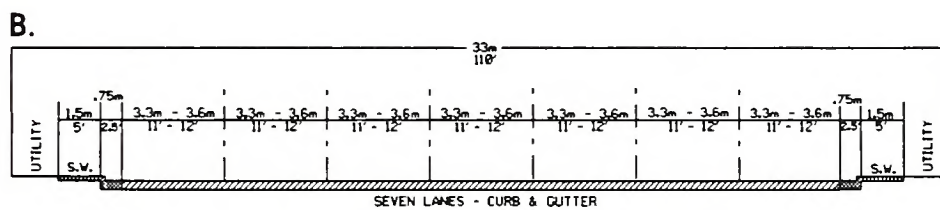
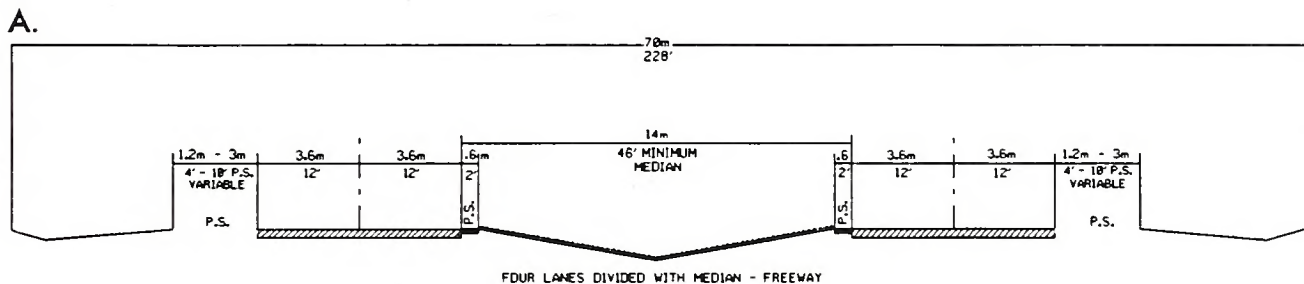
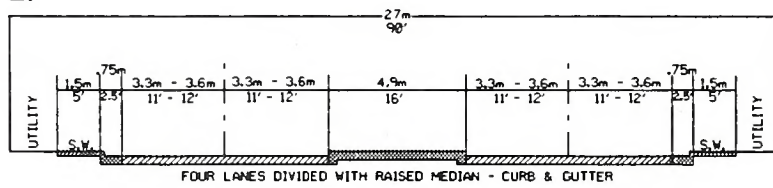


FIGURE C-1

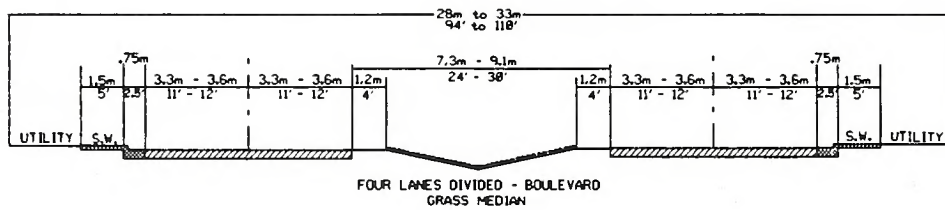


# TYPICAL THOROUGHFARE CROSS SECTIONS

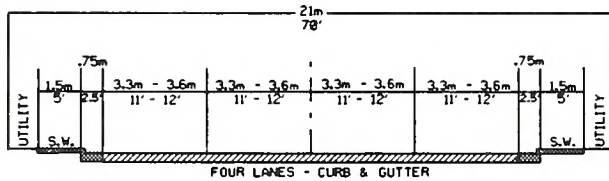
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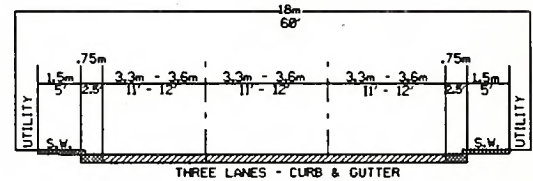
F.



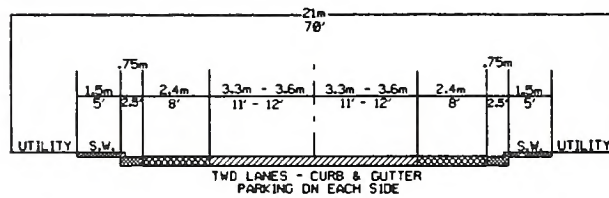
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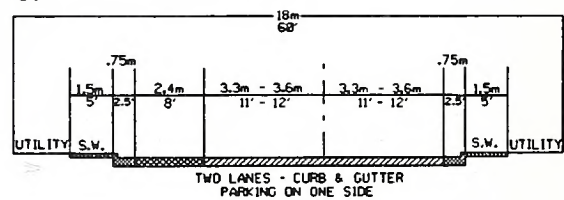
H.



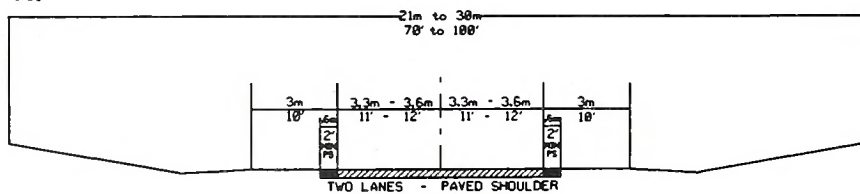
I.



J.

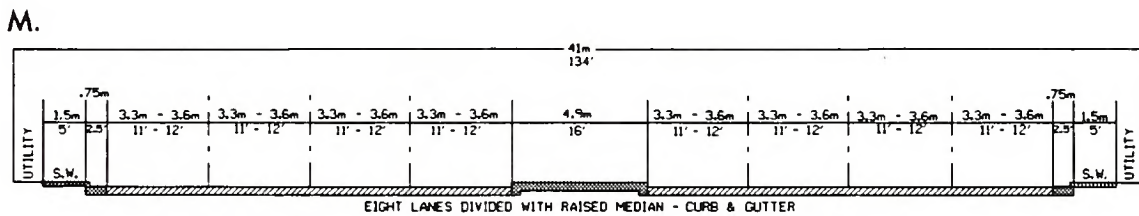
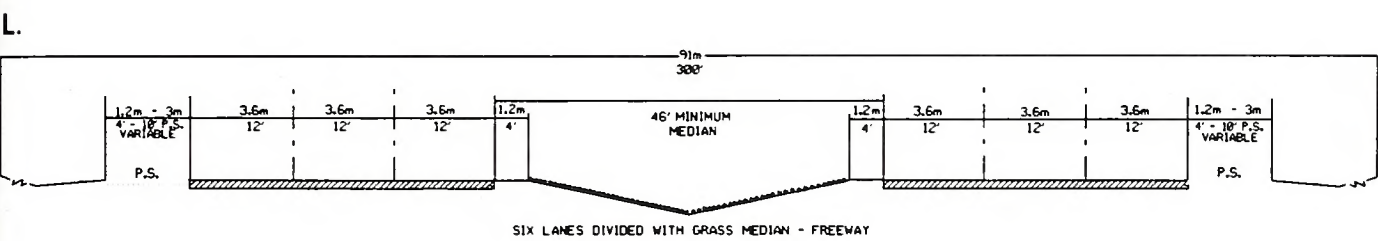


K.

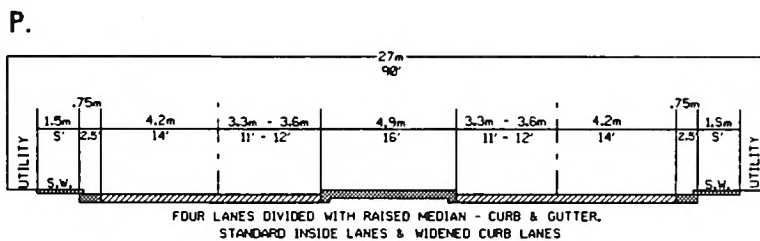
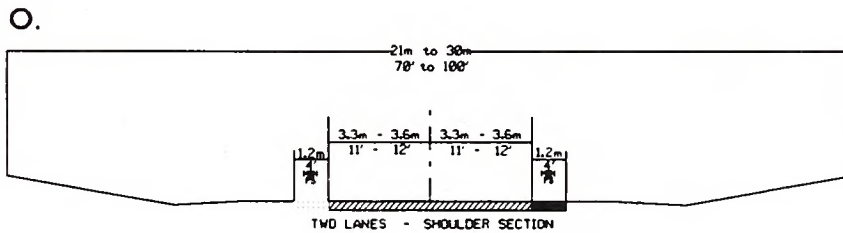
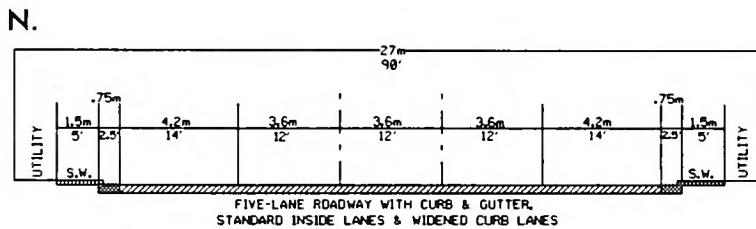




# TYPICAL THOROUGHFARE CROSS SECTIONS



## TYPICAL THOROUGHFARE CROSS SECTIONS FOR ACCOMMODATING BICYCLES









# Appendix D







# **Appendix D**

## **Traffic Model Development**

In order to develop an efficient thoroughfare plan for Johnston County, it was decided to develop and calibrate a traffic model of the area. Developing a traffic model requires the following steps: define the study area, collect traffic counts and socioeconomic data, determine the trip generation characteristics of the study area, calibrate the traffic model so that it duplicates patterns of the study area, and project the socioeconomic data to the design year. Once the socioeconomic data has been projected, the model may be used to evaluate various street system problems and alternate solutions to the problems.

### **The Study Area**

The study area for Johnston County consists of the entire county. Although the municipalities of Benson, Clayton, Princeton and Smithfield-Selma were modeled previously, they were still included in the study. The county was divided into 194 zones for data collection and aggregation. These zones reflect similar land use throughout the planning area. The zone map is shown at the back of the appendix as Figure D2.

### **The Base Year Network**

The purpose of the traffic model is to replicate the conditions on the county street system. Therefore, it is necessary to represent the existing street system in the model. There is a balance between having too many streets on the model to allow it to be calibrated and not having enough streets to realistically duplicate existing conditions. Generally, all the functionally classified interstates, arterials and some of the major land access or collector streets need to be represented. Figure D1 shows the modeled network overlaid on the actual street system.

Street capacity is an important component of the model. The volume to capacity ratio ( $v/c$ ) gives us our best indication of present and future traffic congestion. Speed and distance are the major factors that define the minimum time paths from zone to zone. The model uses the minimum time paths as the basis for assigning traffic to streets. Generally in the Johnston County model the speeds assigned to links of the street system are at or slightly below the posted speed limit. Tranplan was the modeling software used in this study.









## LEGEND

MODELED LINKS —

FIGURE D-1

## TRANPLAN NETWORK

### JOHNSTON COUNTY NORTH CAROLINA

PREPARED BY THE  
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
STATEWIDE PLANNING BRANCH

IN COOPERATION WITH THE  
U.S. DEPARTMENT OF TRANSPORTATION  
FEDERAL HIGHWAY ADMINISTRATION  
SCALES









## **Data Requirements**

In order to produce an adequate traffic model of the study area, two additional types of data are required. First, traffic counts on routes used in the model provide a basis for calibrating the model. These traffic counts show a snapshot of traffic conditions in the study area. Second, socioeconomic data (housing counts and an employment survey) is necessary in order to generate traffic on the model.

### **Traffic Counts**

The model must be calibrated against existing conditions in the study area. In order to calibrate the model traffic counts must be taken at various locations around the study area. In addition, volumes on all routes crossing the planning area boundary were counted. These counts show how much traffic is entering and exiting the study area. The ADT counts for 1995 were used in conjunction with special counts in order to calibrate this model.

### **Socioeconomic Data**

The required data consists of housing counts and an employment survey. The housing counts are used in the model as the generator of trips and employment is used as the attractor of trips.

The normal procedure for this type of study is to conduct a windshield survey to collect housing and employment data. Since the housing is spread throughout the county and hand rating each house was time consuming, another alternative was used to collect the housing data. Johnston County has a Geographical Information System (GIS) of every parcel in the county. This database shows the parcel boundaries, the owner of the property, the address of the parcel and a parcel ID number. The county also has a tax database with over 100 different codes for each parcel. Both of these databases were merged together so that each parcel had its tax information associated with it. Part of the information in this database was the value of the house on the parcel, the value of the land and the type of dwelling unit. The value of the house was used as the measure for the trip making tendency. The housing inventory was divided into three classifications: above average, average, below average. Each zone was totaled by using Arcview GIS software and assigning a range of values for each classification. Since there were municipalities where data had been collected previously that data was compared to the GIS information and adjusted accordingly, so that all of the data was in the same horizon years.

Table D1 shows the housing counts for each traffic zone for the base year 1995.

Frequently, the Employment Security Commission (ESC) data is used to determine the employees in an area. However, since the county GIS database classified parcels into different types of employment, is updated on a daily basis and is located by coordinates it was determined to be more accurate. The employment data in the GIS database had to be converted from the county classification type to the Standard Industrial Code classification that is normally used. The employment was grouped into five categories: Industry, Special Retail, Retail, Office and Services. Table D2 shows total employment by traffic analysis zone for the base year. The employment in the rural zones was hand verified in the field through a windshield survey. The employment in the municipalities was taken from the previous studies and checked against the GIS database.



Table 1

Table 2

Table 3

Table 4

Table 5

Table 6

Table 7

Table 8

Table 9

Table 10

Table 11

Table 12

Table 13

Table 14

Table 15



# Table D1 - 1995 Housing Totals

Zone #	Above	Ave	Below	Total
1	3	11	5	19
2	34	163	71	268
3	8	37	12	57
4	50	86	18	154
5	154	642	186	982
6	97	133	76	306
7	58	323	74	455
8	54	192	56	302
9	58	309	8	375
10	197	300	17	514
11	138	145	47	330
12	90	234	20	344
13	117	272	34	423
14	93	252	75	420
15	158	109	5	272
16	39	50	16	105
17	74	197	38	309
18	34	103	21	158
19	162	112	12	286
20	12	57	34	103
21	2	45	40	87
22	62	200	111	373
23	55	82	82	219
24	49	243	171	463
25	21	109	111	241
26	9	71	69	149
27	31	117	157	305
28	4	18	18	40
29	12	35	49	96
30	38	226	206	470
31	47	197	102	346
32	17	61	20	98
33	22	113	141	276
34	8	61	205	274
35	6	61	28	95
36	4	47	30	81
37	12	71	74	157
38	7	59	75	141
39	16	47	52	115
40	2	12	18	32
41	12	16	30	58
42	1	34	35	70
43	14	53	49	116
44	4	30	20	54
45	3	32	25	60
46	11	50	79	140
47	12	35	56	103
48	1	24	57	82
49	11	39	64	114
50	2	45	56	103
51	10	18	19	47

**Total** 2135 5978 3074 11187

Zone #	Above	Ave	Below	Total
52	6	11	6	23
53	8	55	72	135
54	19	56	125	200
55	3	81	109	193
56	17	99	129	245
57	12	32	35	79
58	14	131	133	278
59	4	40	52	96
60	25	112	106	243
61	11	52	99	162
62	1	27	36	64
63	5	52	96	153
64	3	17	30	50
65	7	55	35	97
66	7	27	24	58
67	20	155	100	275
68	7	16	31	54
69	76	197	131	404
70	37	78	43	158
71	10	67	108	185
72	13	70	68	151
73	33	167	170	370
74	11	38	29	78
75	53	234	241	528
76	27	112	107	246
77	35	165	150	350
78	15	106	124	245
79	1	5	7	13
80	4	8	0	12
81	15	116	61	192
82	12	41	42	95
83	8	84	97	189
84	16	67	78	161
85	6	7	10	23
86	3	3	3	9
87	37	203	127	367
88	16	108	69	193
89	21	116	135	272
90	0	8	3	11
91	7	76	94	177
92	6	38	63	107
93	6	42	47	95
94	2	35	22	59
95	44	475	596	1115
96	13	259	354	626
97	20	127	115	262
98	153	440	243	836
99	3	15	14	32
100	18	93	55	166
101	45	143	31	219
102	2	96	7	105

**Total** 937 4857 4662 10456



# Table D1 - 1995 Housing Totals

Zone #	Above	Ave	Below	Total
103	22	168	37	227
104	3	111	101	215
105	15	333	188	536
106	22	217	40	279
107	3	7	8	18
108	15	188	747	950
109	279	622	373	1274
110	11	59	35	105
111	144	344	312	800
112	9	27	48	84
113	14	68	76	158
114	11	81	74	166
115	59	83	45	187
116	33	47	22	102
117	96	270	109	475
118	110	268	57	435
119	18	98	49	165
120	31	219	23	273
121	110	416	201	727
122	200	317	136	653
123	9	119	98	226
124	29	270	153	452
125	10	105	102	217
126	77	160	148	385
127	180	121	34	335
128	412	225	80	717
129	154	102	68	324
130	170	174	41	385
131	267	118	35	420
132	36	114	116	266
133	14	70	41	125
134	94	267	92	453
135	31	72	90	193
136	76	489	129	694
137	29	124	65	218
138	14	56	50	120
139	29	121	51	201
140	44	215	104	363
141	29	87	142	258
142	10	84	115	209
143	14	179	147	340
144	16	69	48	133
145	6	38	43	87
146	29	161	142	332
147	8	24	27	59
148	23	69	82	174
149	36	137	114	287
150	38	73	64	175
151	36	103	112	251
<b>Total</b>	3125	7889	5214	16228



Table D2 - 1995 Employment Totals

Zone#	Industry	Retail	Highway Retail	Service	Office	Special Industry	Total Employment
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	2	0	2
6	2	16	30	0	10	0	58
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0
18	0	0	0	0	2	0	2
19	73	7	2	0	29	0	111
20	0	3	0	0	1	0	4
21	0	0	0	0	1	0	1
22	16	0	43	2	13	0	74
23	0	0	0	0	0	0	0
24	14	8	0	0	3	0	25
25	0	7	2	0	2	0	11
26	125	1	0	2	6	0	134
27	49	0	4	0	8	0	61
28	150	0	0	0	1	0	151
29	0	6	0	0	2	133	141
30	52	92	124	166	46	0	480
31	5	8	0	180	0	0	193
32	10	1	4	8	0	0	23
33	5	46	29	12	11	0	103
34	460	200	166	149	21	0	996
35	0	50	61	14	21	0	146
36	0	0	0	3	0	0	3
37	0	33	0	1	5	0	39
38	2	0	0	0	3	0	5
39	0	4	0	0	0	0	4
40	50	0	0	0	0	0	50
41	0	0	0	0	0	0	0
42	5	20	6	0	0	0	31
43	49	0	8	1	4	0	62
44	9	0	2	0	2	0	13
45	0	4	1	0	0	0	5
46	10	3	1	0	3	0	17
47	1	0	0	0	2	0	3
48	0	0	0	0	0	0	0
49	0	12	0	0	5	0	17
50	0	0	0	0	0	0	0
51	20	0	3	0	6	57	86
52	0	5	8	2	3	0	18
53	0	0	2	0	7	0	9
54	7	1	0	0	4	0	12
55	0	0	5	0	4	0	9
56	0	8	0	0	9	0	17
57	3	1	0	0	5	0	9
58	4	0	36	0	3	0	43
59	0	45	7	18	15	0	85
60	12	0	4	0	13	0	29
61	0	0	3	0	5	0	8
62	0	0	0	0	0	0	0
63	14	4	1	0	18	0	37
64	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0
66	57	5	0	0	0	0	62
67	276	2	35	91	36	0	440
68	68	10	0	4	0	0	83
69	18	52	58	23	13	0	164
70	17	4	2	0	0	0	23
71	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0
74	0	3	0	6	0	0	9
75	183	117	30	180	101	0	611
76	12	18	0	4	0	0	34
77	185	16	2	D9 9	2	0	214



Table D2 - 1995 Employment Totals

Zone#	Industry	Retail	Highway Retail	Service	Office	Special Industry	Total Employment
78	24	33	28	80	16	0	181
79	0	0	3	0	0	0	3
80	0	0	0	0	0	0	0
81	0	0	0	0	1	0	1
82	0	0	0	0	1	0	1
83	25	2	7	0	1	0	35
84	10	0	0	1	3	0	14
85	0	0	20	0	2	0	22
86	348	0	93	0	14	0	455
87	1	78	231	29	60	0	399
88	19	99	16	29	45	0	208
89	65	25	35	5	52	72	254
90	0	0	0	0	0	0	0
91	2	9	11	3	11	74	110
92	2	128	0	2	40	55	227
93	0	0	5	0	1	0	6
94	15	13	5	152	0	0	185
95	691	288	129	274	196	0	1578
96	63	209	83	52	19	0	426
97	648	415	58	0	49	0	1171
98	551	720	279	582	1175	0	3307
99	26	3	0	0	0	0	29
100	12	44	36	47	0	0	138
101	16	3	2	19	338	0	377
102	0	0	0	0	0	0	0
103	65	20	0	3	0	0	89
104	23	0	0	167	0	0	190
105	5	38	32	82	0	0	157
106	42	86	12	9	15	0	163
107	20	23	2	4	4	0	53
108	43	106	157	709	214	0	1230
109	887	240	75	215	785	0	2202
110	0	34	1	4	0	0	40
111	288	135	67	95	174	165	922
112	26	3	2	0	6	0	37
113	13	26	16	0	24	0	79
114	24	2	4	2	9	0	41
115	0	0	0	0	0	0	0
116	0	0	0	0	0	0	0
117	0	0	0	0	0	0	0
118	142	8	0	0	1	0	151
119	1497	56	29	43	29	0	1654
120	0	0	0	0	0	0	0
121	63	17	18	2	137	0	237
122	16	46	73	9	212	0	356
123	1112	93	58	99	257	0	1619
124	0	79	56	41	68	0	244
125	0	0	0	0	4	0	4
126	30	13	0	0	109	0	152
127	711	0	0	0	2	0	713
128	1762	7	2	0	45	0	1816
129	0	0	0	0	0	0	0
130	0	0	0	0	20	0	20
131	3	0	0	0	3	0	6
132	0	6	0	0	13	0	19
133	0	2	0	0	1	0	3
134	0	0	0	0	0	0	0
135	1	3	0	0	0	0	4
136	99	1	4	6	10	0	121
137	0	3	3	0	3	0	9
138	0	2	0	0	18	0	20
139	22	0	1	0	1	0	24
140	0	3	5	0	4	76	88
141	2	4	11	0	8	0	25
142	0	0	0	0	10	0	10
143	0	1	2	0	14	0	17
144	0	1	1	0	7	0	9
145	20	0	5	0	1	0	26
146	1	2	5	0	6	0	14
147	0	0	0	0	2	0	2
148	0	1	2	0	6	0	9
149	89	0	0	0	15	0	104
150	0	0	0	0	0	0	0
151	0	0	0	0	0	0	0
Totals	11488	3944	2365	3641	4706	632	26775



## Commercial Vehicles

Commercial vehicles have somewhat different trip generation characteristics than do privately owned vehicles. An inventory of commercial vehicles was done at the same time as the employment inventory for the study area.

## Trip Generation

The trip generation process is the process in which external station volumes, housing data, and employment data are used to generate traffic volumes that duplicate the traffic volumes on the street network. The technical definition of a trip is slightly different than the definition of a trip used by the general public. Technically a trip only has one origin and one destination while the layman will often group, or chain, several short trips together as one longer trip.

Traffic inside the study area has three major components: through trips, internal-external trips, and internal trips. Through trips are produced outside the planning area and pass through en-route to a destination outside the planning area. Internal-external trips have one end of the trip outside of the planning area. Internal trips have both their origin and destination inside the planning area. For clarity, the internal trips are further subdivided into trip purposes. The trip purposes for this study are home-based work, other-home based, and non-home based.

Table D3 gives a summary of each trip purpose and Table D4 illustrates the variables that are considered when determining trip percentages.

**Table D3**

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**Travel Data Summary**

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Type	1995	2020
Internal Trips	206,043	295,618
Home Based Work	53,571	62,080
Other Home Based	107,142	168,502
Non-Home Based, Internal	45,329	65,036
NHB Secondary	27,458	35,216
Internal <-> External	130,582	266,361
Through Trips	57,534	113,479
Total Daily Trips	421,707	710,674

---

Trips = Vehicle Trips



**Table D4****Travel Model Input Variables****1995 Trip Percentages by Purpose**

Internal of Total	90%
HBW	26%
OHB	52%
NHB	22%

**2020 Trip Percentages by Purpose**

Internal of Total	80%
HBW	21%
OHB	57%
NHB	22%

Year	Persons/DU
1995	2.50
2020	2.25

**Generation Rates For Typical Households in Study Area**

<u>Above</u> 10 trips/HH	<u>Average</u> 8 trips/HH	<u>Below</u> 6 trips/HH
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*Note: There were several zones in the model that used other generation rates to determine the trips for that zone. See description that follows. Trips are referring to vehicle trips.*

Although the typical generation rates were used for the majority of the county there were a few select zones that used other rates because of the nature of the trip making in those areas. The rural area north of Clayton is sparsely populated and the trips generated in this area are not typical of the rest of the county. Due to its proximity to Wake County and the all or nothing loading methodology using the typical rates produced an excess amount of trips. Therefore it was decided to leave the three housing classifications but to reduce the trip generation rates for those zones only to six for above, four for average, and two for below average. This corrected the trip generation errors in this part of the county.

**Secondary NHB Trip Development**

Secondary NHB Trips = Total Ext-Int Trips - Ext-Int Trips Garaged Inside Planning Area X NHBS Factor\*

$$1995 \text{ Secondary NHB Trips} = (91955 - 22894) \times 0.40 = 27,624$$

$$2020 \text{ Secondary NHB Trips} = (162,475 - 73,905) \times 0.40 = 35,428$$

The breakdown of internal trips by purpose and total of non-home based trips generated externally are shown in Table D4.

\*Assumed NHB trip making rate per each one-way external-internal trip by vehicles garaged outside the planning area.



## Through Trips

The Through Trip Table for this study was developed based on Statewide Planning Technical Report Number 3 (Synthesized Through Trip Table for Small Urban Areas By Dr. David G. Modlin, Jr.).

Once these volumes were developed, the Fratar balancing method was then used to balance the trip interchanges so that the total number of through trips at each external station is consistent with the total number of through trips at every other station. Generally five iterations are sufficient to balance the estimate between external zones. Since the SYNTH program is intended for small urban type areas, hand adjusting was necessary in order to better replicate the through trips in the county.

## External - Internal

The external-internal trip volume was determined by subtracting the through trip volume at each station from the total traffic volume at that station. Table D5 lists the external-internal and through trip values.

## Internal Data Summary (IDS)

IDS is the process that takes the external-internal traffic volumes, housing data, employment data, generation rates, and regression equations and generates the trip productions and trip attractions required by the gravity model. Housing units were stratified to account for differing trip generation rates for each classification. The individual trip generation rates give an average trip generation rate for the study area of 6.93 trips per dwelling unit (du).

Trip attractions were produced using regression equations. The regression equations consider trip attractions to be related to the employment characteristics of the traffic zones. The regression equations for the Johnston County study area are:

$$\text{HBW } Y = 1.0X_1 + 1.0X_2 + 1.0X_3 + 1.0X_4 + 1.0X_5$$

$$\text{OHB } Y = 0.1X_1 + 2.0X_2 + 8.4X_3 + 2.6X_4 + 2.5X_5 + 3.2X_6 + 0.25X_{12}$$

$$\text{NHB } Y = 0.2X_1 + 2.0X_2 + 8.4X_3 + 2.6X_4 + 2.5X_5 + 3.2X_6 + 0.60X_{12}$$

$$\text{EXT } Y = 0.5X_1 + 2.0X_2 + 8.4X_3 + 2.6X_4 + 2.5X_5 + 3.2X_6 + 0.10X_{12}$$

Where:

- Y = Attraction factor for each zone
- X<sub>1</sub> = Industry (SIC codes 1-49)
- X<sub>2</sub> = Retail (SIC codes 55,58)
- X<sub>3</sub> = Special Retail (SIC codes 50-54, 56, 57, 59)
- X<sub>4</sub> = Office (SIC codes 60-67, 91-97)
- X<sub>5</sub> = Services (SIC codes 70-76, 78-89, 99)
- X<sub>6</sub> = Special Industries
- X<sub>12</sub> = Attraction caused by housing

The output of the IDS program are trip productions and trip attractions for each zone divided into four trip purposes: home-based work, home-based other, non-home based and external-internal. The trips are segregated into trip purposes because different trip lengths are associated with each trip purpose.



**Table D5 - External-Internal Trips for the Model**

Computer Station #	Description	1995 ADT	1995 Thru Trips	1995 Ext-Int trips	2020 ADT	2020 Thru Trips	2020 Ext-Int Trips
159	SR 2143	3900	25	3850	6200	40	6120
160	NC 210	3400	186	3028	7100	389	6322
161	SR 1309	1300	7	1286	3300	18	3264
162	SR 1168	1200	6	1188	1800	9	1782
163	NC 27	5000	377	4246	8500	641	7218
164	US 301	6900	556	5788	10000	806	8388
165	I95	38800	15862	7076	72000	29503	12994
166	NC 242	1200	8	1184	1700	11	1678
167	NC 96	750	4	742	1300	7	1286
168	NC 50	1000	5	990	2000	10	1980
169	I 40	13000	5323	2354	31000	12669	5662
170	US 701	3100	389	2322	5500	689	4122
171	SR 1008	800	4	792	1200	6	1188
172	SR 1007	1000	6	988	1400	8	1384
173	US 70	19100	3533	12034	48000	8867	30266
174	SR 1002	1000	0	1000	3000	18	2964
175	NC 222	1900	589	722	2500	777	946
176	US 301	8200	1231	5738	13000	1957	9086
177	I 95	30800	11177	8446	59000	21460	16080
178	NC 42	2800	293	2214	4200	440	3320
179	NC 231	700	316	68	1100	496	108
180	NC 222	600	30	540	1300	66	1168
181	SR 1723	1300	507	286	2000	781	438
182	NC 39	2800	143	2514	5000	256	4488
183	NC 96	2800	143	2514	3500	179	3142
184	SR 1723	1300	507	286	2000	781	438
185	NC 231	3200	321	2558	4600	462	3676
186	SR 1003	1900	10	1880	4900	26	4848
187	US 70A	3900	99	3702	6700	170	6360
188	US 70	30100	3664	22772	25200	4865	15470
189	SR 1525	3200	382	2436	4200	500	3200
190	I 40	32500	10855	10790	104200	24939	54322
191	SR 1010	5400	415	4570	9000	693	7614
192	NC 50	4000	178	3644	7500	335	6830
193	NC 42	5400	375	4650	8500	589	7322
194	SR 1533	1400	8	1384	2800	16	2768

Note: \*\* 60% Reduction in External Station 188 b/c of Clayton Bypass traffic using different route in future

\*\*\* Station 188 reduction added to station 190



## Internal Trip Distribution

Once the number of trips per traffic zone is determined, the trips must still be distributed to other traffic zones. The preferred method of distributing internal and external-internal trips, called the 'Gravity Model', states that the number of trips between Zone A and Zone B is multiplied by a travel time factor. This distribution is based on Newton's Law of mass distribution.

The gravity model takes the form:

$$T_{ij} = \frac{P_i * A_j * F_{ij}}{\sum_{x=1, n} A_x F_{i,x}}$$

Where:  $T_{ij}$  = The number of trips produced in zone i and attracted to zone j.  
 $P_i$  = The number of trips produced in zone i.  
 $A_j$  = The number of trips attracted to zone j.  
 $F_{ij}$  = The travel time factor.  
 $n$  = The total number of zones.  
 $i$  = The origin zone number.  
 $j$  = The destination zone number.  
 $x$  = Any zone number.

The travel time factor or friction factor (F) is critical to the gravity model distribution and must be derived empirically. The friction factor is dependent on the distance between the traffic zones and the time necessary to travel these distances. This factor is also dependent on the trip purpose. In order to derive this factor, a gravity model calibration program is run with an initial friction factor and trip length frequency curve for each trip purpose. Table D6 shows the actual values used for the friction factors for Johnston County.

**Table D6 - Friction Factors**

Time	HBW	OHB	NHB	Ext-Int		Time	HBW	OHB	NHB	Ext-Int
1	2000	4000	5000	2000		22	400	175	110	3338
2	2000	3000	5000	2000		23	258	122	82	2452
3	33705	46913	45000	45714		24	169	85	62	1798
4	42782	42233	35000	52715		25	113	60	47	1319
5	50081	36765	29192	58189		26	77	43	36	971
6	54340	31018	20835	61621		27	54	32	28	718
7	54928	25417	14848	62743		28	40	23	22	535
8	51983	20274	10571	61562		29	30	18	17	402
9	46294	15777	7522	58335		30	24	14	13	306
10	38990	12005	5353	53504		31	20	11	11	236
11	31214	8951	3812	47603		32	18	9	9	185
12	23872	6554	2717	41176		33	16	7	7	148
13	17529	4724	1940	34704		34	16	6	6	121
14	12421	3359	1388	28563		35	18	6	5	101
15	8536	2361	996	23008		36	20	5	4	86
16	5717	1644	717	18179		37	25	5	4	76
17	3752	1137	518	14120		38	35	5	3	69
18	2424	783	376	10805		39	52	5	3	64
19	1550	537	274	8165		40	85	6	3	62
20	985	369	201	6106		41	153	6	3	62
21	626	254	148	4528						



## Model Calibration

The purpose of a traffic model is to predict the traffic on a street system at some future point in time. However, if the model is not accurate, it is useless for this purpose. Therefore, the model must duplicate the existing traffic pattern. The actual calibration of the model is an iterative process in which incremental changes are made either in the trip generation, trip distribution, or the street network. The purpose of each change is to allow the model to more accurately reflect the real world conditions upon which it is based. Only when the model can adequately reflect the existing traffic pattern should it be used to predict traffic in the future.

## Accuracy Checks

There are three checks made on the model. The first is to follow trips through all the steps involved in the model. The purpose of this check is to insure that no trips have been accidentally added to or subtracted from the model, and that no trips have been counted twice.

The second check is to compare the model-generated trips on the screenlines with the ground counts taken at the screenlines. A model is considered to accurately reflect the overall patterns if the trips it generates are from 95% to 105% of the ground counts on the screenlines. Table D7 compares the ground counts with the model traffic volumes on the screenlines.

**Table D7**

Actual vs. Modeled Screenline Totals			
Screenline	Ground Count	Model Volume	Percent
A (NS)	42250	42974	1.02
B (EW)	51850	54019	1.04

The final check for the model is to match the traffic volumes on the links in the model with the ADT at the same locations. The 'link counts' can be used to find particular places in the network where there are problems. Comparing the link counts with the ground counts for those links did not reveal any significant problems with the model.

## Data Projections to the Design Year 2020

In order to make use of the model, the base year data must be modified to reflect assumed conditions in the design year. These projections and the previously developed regression equations were used to produce future trip productions and attractions in the same manner as the base year.

### Housing and Employment Projections

All of the data from the base year was forecasted to the year 2020 in order to develop the plan. The details of how these numbers were achieved is described in Chapter 5 of the report. Tables D8 and D9 show the 2020 design year socioeconomic data.



Table D8-2020 Housing Totals

Zone #	Above	Ave	Below	Total
1	6	41	5	52
2	74	363	101	538
3	31	117	32	180
4	50	86	18	154
5	254	1242	586	2082
6	112	333	141	586
7	199	510	214	923
8	207	467	139	813
9	148	408	89	645
10	407	720	137	1264
11	240	338	62	640
12	346	753	38	1137
13	285	650	49	984
14	201	461	113	775
15	379	471	93	943
16	45	144	66	255
17	384	660	216	1260
18	94	177	107	378
19	272	169	193	634
20	33	83	97	213
21	27	59	88	174
22	147	317	269	733
23	82	139	143	364
24	140	304	342	786
25	102	205	242	549
26	35	108	144	287
27	40	150	218	408
28	6	30	29	65
29	18	54	92	164
30	90	426	399	915
31	88	243	151	482
32	28	107	38	173
33	32	205	269	506
34	26	227	373	626
35	9	77	40	126
36	6	55	36	97
37	24	115	134	273
38	7	59	75	141
39	18	52	62	132
40	3	13	21	37
41	13	20	36	69

Zone #	Above	Ave	Below	Total
42	3	37	43	83
43	15	58	61	134
44	5	32	25	62
45	4	34	30	68
46	11	56	92	159
47	12	41	69	122
48	1	25	58	84
49	12	40	68	120
50	3	46	60	109
51	11	20	25	56
52	6	12	9	27
53	11	61	89	161
54	22	62	136	220
55	3	86	115	204
56	18	107	141	266
57	13	34	42	89
58	18	143	146	307
59	7	79	92	178
60	30	124	124	278
61	13	58	109	180
62	2	31	44	77
63	6	56	106	168
64	4	18	35	57
65	8	60	43	111
66	27	60	69	156
67	36	155	124	315
68	14	52	82	148
69	101	338	341	780
70	42	89	54	185
71	13	73	120	206
72	15	75	78	168
73	38	182	184	404
74	12	60	84	156
75	66	318	301	685
76	41	138	112	291
77	38	206	201	445
78	65	202	255	522
79	1	5	9	15
80	4	9	1	14
81	18	126	76	220
82	13	43	52	108



Table D8-2020 Housing Totals

Zone #	Above	Ave	Below	Total
83	9	94	115	218
84	18	72	94	184
85	6	9	12	27
86	3	4	4	11
87	41	228	139	408
88	18	128	76	222
89	26	126	160	312
90	0	8	5	13
91	10	81	109	200
92	8	44	70	122
93	7	45	53	105
94	108	267	163	538
95	199	546	827	1572
96	65	379	630	1074
97	39	142	195	376
98	225	679	454	1358
99	3	29	35	67
100	24	133	72	229
101	245	296	119	660
102	2	96	7	105
103	81	293	132	506
104	33	230	164	427
105	28	404	319	751
106	83	433	81	597
107	10	37	39	86
108	66	269	747	1082
109	367	634	450	1451
110	28	87	67	182
111	152	408	343	903
112	13	42	58	113
113	18	82	102	202
114	30	163	145	338
115	65	133	85	283
116	40	142	50	232
117	259	1117	219	1595
118	251	1171	213	1635
119	207	132	49	388
120	88	729	104	921
121	310	706	301	1317
122	350	705	186	1241
123	209	519	135	863

Zone #	Above	Ave	Below	Total
124	29	270	153	452
125	85	205	103	393
126	299	285	198	782
127	205	171	59	435
128	589	1086	466	2141
129	255	495	126	876
130	580	6248	1269	8097
131	307	1334	1044	2685
132	159	470	225	854
133	42	273	128	443
134	192	788	235	1215
135	46	149	150	345
136	93	632	325	1050
137	59	184	155	398
138	18	117	113	248
139	40	221	161	422
140	69	373	233	675
141	39	138	227	404
142	13	99	156	268
143	17	205	203	425
144	19	99	74	192
145	8	42	49	99
146	31	169	160	360
147	9	26	33	68
148	26	79	97	202
149	38	150	126	314
150	39	76	76	191
151	39	113	122	274

**Totals**  
**All Zones    12579    10948    23396    76923**



Table D9-2020 Employment Totals

Zone#	Industry	Retail	Highway Retail	Service	Office	Special Industry	Total Employment
1	40	60	302	50	75	0	527
2	0	20	10	3	12	0	45
3	0	0	0	30	0	0	30
4	0	0	0	0	0	0	0
5	0	5	0	0	6	50	61
6	22	116	65	30	30	0	263
7	20	300	100	100	100	0	620
8	0	14	18	30	2	0	64
9	0	2	2	10	2	0	16
10	20	20	15	20	12	190	277
11	10	100	140	30	100	0	380
12	0	14	40	27	10	0	91
13	0	10	25	20	10	0	65
14	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0
16	0	2	4	0	4	0	10
17	0	0	0	0	0	0	0
18	0	4	0	0	12	80	96
19	73	11	4	0	33	0	121
20	0	9	0	0	5	0	14
21	0	0	0	0	3	0	3
22	46	20	123	22	58	165	434
23	0	0	0	0	0	0	0
24	14	18	4	0	13	0	49
25	0	19	8	0	10	0	37
26	275	9	8	22	81	0	395
27	119	8	14	4	30	0	175
28	350	8	4	4	7	0	373
29	0	16	2	0	12	133	163
30	52	92	124	166	206	0	640
31	5	8	0	180	138	0	331
32	10	1	4	8	32	0	55
33	5	46	29	12	41	0	133
34	460	200	166	149	75	0	1050
35	0	43	81	60	73	0	257
36	0	0	0	3	41	0	44
37	0	33	0	1	5	0	39
38	12	4	2	4	33	0	55
39	0	14	2	0	4	0	20
40	50	0	0	0	0	0	50
41	0	0	0	0	0	0	0
42	15	55	18	10	8	0	106
43	114	4	24	1	12	0	155
44	21	2	10	0	8	0	41
45	0	12	11	0	4	0	27
46	22	9	5	0	11	0	47
47	3	2	2	0	2	0	9
48	0	0	0	0	0	0	0
49	0	30	4	0	15	0	49
50	0	0	0	0	0	0	0
51	60	10	13	8	26	57	174
52	0	15	24	12	11	0	62
53	0	0	12	0	17	0	29
54	17	7	2	0	14	0	40
55	0	4	17	0	16	0	37
56	0	18	4	0	29	0	51
57	9	5	4	0	15	0	33
58	14	4	84	0	11	0	113
59	0	104	22	50	45	0	221
60	30	4	12	0	38	0	84
61	0	2	9	0	15	0	26
62	0	0	0	0	0	0	0
63	39	12	7	0	42	0	100
64	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0
66	131	6	0	0	0	0	137
67	304	16	38	103	45	0	506
68	121	12	10	10	12	0	166
69	34	67	73	36	65	0	275
70	36	13	8	0	4	0	61
71	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0
73	0	0	2	0	4	0	6
74	0	11	6	6	4	0	27
75	424	296	78	398	249	0	1445
76	26	68	24	18	6	0	142
77	399	35	6	30	8	0	478
78	27	37	30	90	17	0	201
79	0	0	3	0	0	0	3



Table D-3 2020 Employment Totals

Zone#	Industry	Retail	Highway Retail	Service	Office	Special Industry	Total Employment
80	0	0	0	0	0	0	0
81	0	0	0	0	3	0	3
82	0	0	0	0	3	0	3
83	55	6	21	0	5	0	87
84	10	0	0	1	3	0	14
85	0	4	46	0	8	0	58
86	635	10	293	10	44	0	992
87	31	176	531	65	140	0	943
88	49	299	46	69	105	0	568
89	140	60	85	15	118	72	490
90	0	0	0	0	0	0	0
91	6	21	31	13	31	74	176
92	6	268	10	12	90	55	441
93	0	0	15	0	5	0	20
94	116	14	26	170	0	0	326
95	822	326	146	169	349	0	1812
96	70	231	91	58	27	0	477
97	674	452	64	1	53	0	1244
98	615	776	317	1368	500	0	3576
99	29	23	34	100	50	0	236
100	63	79	40	52	10	62	305
101	28	23	12	80	426	0	568
102	0	0	0	0	0	0	0
103	172	62	20	53	80	0	388
104	76	50	20	186	60	0	392
105	56	102	95	92	50	0	395
106	146	115	23	30	76	0	389
107	22	26	2	5	5	0	60
108	48	119	172	650	376	0	1366
109	979	267	82	237	876	0	2441
110	0	38	1	0	5	0	45
111	306	137	70	85	194	165	955
112	56	9	12	0	16	0	93
113	37	64	48	0	64	0	213
114	62	12	15	12	32	0	133
115	0	0	0	0	0	0	0
116	0	0	0	0	0	0	0
117	0	8	4	0	6	0	18
118	322	28	10	6	11	0	377
119	2184	82	43	63	43	0	2415
120	0	8	4	0	6	0	18
121	92	25	27	3	200	0	347
122	251	125	403	14	384	0	1177
123	1972	136	135	145	325	0	2713
124	0	116	82	60	100	0	358
125	0	0	0	0	6	0	6
126	44	19	0	0	159	50	272
127	714	0	0	0	3	0	717
128	3762	27	10	10	105	0	3914
129	0	4	0	6	2	0	12
130	0	6	4	10	46	0	66
131	16	0	0	0	65	0	81
132	0	12	4	6	43	160	225
133	0	8	0	0	7	0	15
134	0	2	0	0	4	70	76
135	2	7	0	0	2	0	11
136	508	75	74	37	72	0	767
137	0	9	11	0	9	0	29
138	0	6	0	0	48	0	54
139	70	4	7	0	5	0	86
140	0	9	25	0	14	76	124
141	12	14	41	4	20	0	91
142	0	2	2	0	40	0	44
143	0	5	8	0	42	0	55
144	0	5	3	0	17	0	25
145	50	2	15	0	5	0	72
146	5	8	15	0	16	0	44
147	0	0	0	0	6	0	6
148	0	5	6	0	16	0	27
149	89	2	0	0	40	0	131
150	0	0	0	0	0	0	0
151	3	5	2	0	35	0	45
152	0	0	0	0	0	0	0
153	0	5	10	8	0	0	23
154	0	0	0	0	0	0	0

Totals 18835 6625 5172 5663 7732 1459 45486



## 2020 External and Through Trips

For the design year, external and through trips were projected from the base year using a linear projection of the past growth rate at each external station. Once a final volume was settled upon, a ratio had to be determined in order for the model to use the base conditions to “Fratar” to the future years. Table D10 shows the future external station volumes. The through trips were handled in the same manner as the base year.

**Table D10 – 2020 External Volumes**

Station	Description	1995 ADT	2020 projected	Growth %	Fratat Ratio
159	SR 2143	3900	6200	1.9	1.59
160	NC 210	3400	7100	2.9	2.09
161	SR 1309	1300	3300	2.7	2.54
162	SR 1168	1200	1800	1.64	1.50
163	NC 27	5000	8500	2.1	1.70
164	US 301	6900	10000	1.5	1.45
165	I 95	38800	72000	2.5	1.86
166	NC 242	1200	1700	2.1	1.42
167	NC 96	750	1300	2.2	1.73
168	NC 50	1000	2000	2.8	2.00
169	I 40	13000	31000	2.7	2.38
170	US 701	3100	5500	1.9	1.77
171	SR 1008	800	1200	1.6	1.50
172	SR 1007	1000	1400	1.4	1.40
173	US 70	19100	48000	3.75	2.51
174	SR 1002	1000	3000	2	3.00
175	NC 222	1900	2500	1.1	1.32
176	US 301	8200	13000	1.9	1.59
177	I 95	30800	59000	2.6	1.92
178	NC 42	2800	4200	1.4	1.50
179	NC 231	700	1100	1.3	1.57
180	NC 222	600	1300	3.1	2.17
181	SR 1723	1300	2000	1.7	1.54
182	NC 39	2800	5000	2.3	1.79
183	NC 96	2800	3500	1	1.25
184	SR 1723	1300	2000	1.7	1.54
185	NC 231	3200	4600	1.5	1.44
186	SR 1003	1900	4900	3.8	2.58
187	US 70A	3900	6700	2.2	1.72
188	US 70	30100	63000	2.4	2.09
189	SR 1525	3200	4200	1.1	1.31
190	I 40	32500	66400	2.9	2.04
191	SR 1010	5400	9000	2.1	1.67
192	NC 50	4000	7500	2.5	1.88
193	NC 42	5400	8500	1.8	1.57
194	SR 1533	1400	2800	2.8	2.00















# Appendix E







# Appendix E1 - Alphabetical SR List

Road Name	SR Number	Road Name	SR Number
ABBINGTON CT	1796	BRIDGE LANE	1783
AIRPORT ROAD	1544	BRIGHT LEAF DR	1688
ALEX AVE	1669	BRISTOL CIRCLE	1777
ALFLFA CT	1878	BRITT STREET	1956
ALFORD AVENUE	2171	BROGDEN ROAD	1007
ALLEN STREET	1203	BROOKFIELD CT	1836
ALLIED MILLS	2400	BROOKGREEN DR	2036
ALPINE WAY	2007	BRYANT POND RD	1119
AMBER LANE	1881	BUCKET JONES RD	1501
AMELIA CHURCH	1552	BUCKHORN LANE	1792
AMOS STREET	1564	BUFFALOE ROAD	1003
ANDERSON STREET	1927	BURNELL CHURCH	1350
ANNIE V DRIVE	1781	BYRD ROAD	1507
ANTIOCH CHURCH	1733	BYRDTOWN ROAD	1361
APPLEWOOD DRIVE	1820	CAMEL STREET	1751
AQUILLA	1307	CAMEL STREET	1753
ASHLEY DRIVE	1611	CAMP ATKINSON	1749
ASTOR STREET	1591	CANTERBURY RD	1861
ATKINSON STREET	1755	CAR MIL DRIVE	2016
AUSTIN POND RD	1549	CARIBOU LANE	2039
AUTUMN DRIVE	1870	CARL CIRCLE	1818
AUTUMN WOODS LN	1887	CAROL STREET	1614
BAGLEY ROAD	2144	CAROLINA AVENUE	1883
BAILEY-BOYKIN	2125	CAROLYN AVENUE	1370
BAKER STREET	1239	CAROLYN AVENUE	1373
BARBOUR CHAPEL	1348	CARROLL ROAD	1543
BARBOUR ROAD	1555	CASPER COURT	2604
BARCLAY LN	1683	CATAWBA DRIVE	1998
BEECHWOOD DRIVE	1616	CEDAR COURT	1636
BELMONT STREET	2502	CEDARWOOD CT	1807
BEN,S CIRCLE	1654	CENTER STREET	1949
BENSON ROAD	1303	CHALMERS DRIVE	1858
BENTONVILLE RD	1197	CHAMPION STREET	1565
BEREA CHURCH RD	1508	CHANDLER COURT	1885
BIG PINE ROAD	1558	CHAPEL DRIVE	1612
BIRCH LANE	1672	CHARLIE LANE	1692
BIRDIE DRIVE	1617	CHATHAM CT	1794
BLANCHE STREET	2374	CHERRY STRET	2396
BLUEBERRY DRIVE	2182	CHRIS COURT	1652
BONNIE AVENUE	2583	CHRISTIAN ST	2035
BOOKER DAIRY RD	1923	CLARENDON CT	1835
BOOKER ROAD	1510	CLEVELAND FIRE	1515
BRADLEY DRIVE	1847	CLEVELAND ROAD	1010
BRANDY COURT	1848	CLOVERDALE ROAD	1598
BRASWELL ROAD	2521	CLYDE CHAPEL RD	1717
BRETT CIRCLE	1839	CLYDESDALE DR	2606
BREWER	1224	CNTRY TRAILS DR	1699
BREWER	1225	COACHMAN CT	1681
BRIAN COURT	1648	COATS STREET	1982
BRIARWOOD DRIVE	2024	COBBLESTONE CT	1806



# Appendix E1 - Alphabetical SR List

Road Name	SR Number	Road Name	SR Number
COLLEGE STREET	2342	DR MAR LUT KING	2502
COLLIER STREET	2504	DRUG STORE ROAD	1524
COLONIAL DRIVE	2013	DUANNE POOL RD	1876
COLT CIRCLE	1851	DUBA COURT	1782
COMPUTER DRIVE	1997	DUCHESS DRIVE	1618
CONE CIRCLE	2030	DUKE STREET	1621
COOPER STREET	1752	DUNN STREET	1214
CORNWALLIS ROAD	1525	EASON DRIVE	1975
COTTONWOOD DRIV	1985	EASON STREET	1613
COUNTRY CLUB RD	1345	EAST GORDON	2406
COUNTRY LANE RD	1623	EDGERTON STREET	1964
COUNTY HOME PIT	1503	EDWARDS	2372
COUNTY HOME RD	1502	ELDRIDGE ROAD	1122
COUNTY LINE RD	1103	ELEVATION ROAD	1308
COVER BRIDGE RD	1700	ELM STREET	1241
COVEY LANE	1667	ENGLEWOOD DRIVE	1801
COX MILL RD	1008	ESSEX LANE	1862
CRANTOP ROAD	1504	EVERETT AVENUE	1585
CREEK VIEW DR	1633	EVERGREEN CIRC	1987
CREEKSIDE DRIVE	2001	FARMPATH ROAD	1981
CREEKSTONE DR	1863	FAWN LANE	1797
CRESTWOOD COURT	1686	FEDERAL AID RD	1331
CRESTWOOD DRIVE	1687	FERNWOOD ROAD	1592
CROSSWINDS DR	1667	FIELDSTONE DR	1786
CRUMPLER	2345	FIELDSTONE LN	1682
CYPRESS COURT	1674	FIRETOWER ROAD	1205
DAIRY ROAD	1583	FIVE POINTS RD	1176
DANBURY COURT	1886	FLOWERS DRIVE	1965
DANIEL DRIVE	1994	FLOWERS STREET	1959
DAOMN STREET	1567	FOREST ROAD	1771
DAUGHTRY ROAD	2514	FORT DRIVE	1624
DAUGHTRY STREET	1976	FOX HOLLOW DR	2037
DAVIS FARM DR.	2180	FOX HOLLOW DR	2038
DAVIS HOMESTEAD	2137	FOX LANE	1554
DAVIS MILL RD	2310	FOX RIDGE ROAD	2008
DAVIS ROAD	1754	FRIENDSHIP CHUR	2102
DEBRO	2152	FULGHUM LIT CRK	2366
DECEMBER COURT	1888	GLENN STREET	1828
DEEP POOL CT	1864	GODWIN LAKE RD	1116
DEER DRIVE	2586	GOLDSBORO ST	2167
DEER RUN	1684	GOODLING	2338
DEERFIELD TRAIL	1791	GOR-AN ROAD	2406
DEERHAVEN LANE	2009	GORDON	1905
DENNING	1168	GOVERNMENT ROAD	1556
DERBY CIRCLE	1767	GRABTOWN ROAD	2543
DEVIL RACE TRCK	1009	GRAHAM POND RD	1321
DICKERSON ROAD	1505	GRANT ST	1829
DIXIE COURT	1780	GRANT STREET	1855
DOE LANE	1799	GREEN PATH	2014
DOGWOOD DRIVE	2179	GREENLEAF RD	1320
DOUGLAS STREET	1674	GREENMEADOW DRI	1986
DOVE CT	1668	GREYBRIDGE CT	1805



# Appendix E1 - Alphabetical SR List

Road Name	SR Number	Road Name	SR Number
HANNA CRK CHUR	1171	JUSTIN DRIVE	1646
HARNETT STREET	1215	KASEY,S CIRCLE	1651
HARPER AVENUE	1237	KEEN ROAD	1178
HARPER ROAD	1562	KEEN STREET	1182
HARRIS ROAD	1843	KEEN STREET	1240
HARRIS STREET	2503	KERRI DRIVE	1649
HARRIS-WILSON	1725	KING DRIVE	2555
HARTLEY STREET	1972	KING MILL ROAD	1334
HEATHER DOWNS L	1679	KING ROAD	1531
HEMLOCK CIRCLE	1677	KINSEY STREET	1232
HEMLOCK PLACE	1639	KRISTI DRIVE	1650
HICKORY DRIVE	1983	LAKE EVA MARIE	1622
HICKORY GRVE CH	1333	LAKE ROAD	1183
HIKING TRAIL	1875	LAKE VISTA DR	2584
HILLCREST DRIVE	1375	LAKE WENDELL RD	1716
HILLCREST LANE	1761	LAKESIDE CIR	1663
HILLINGTON RD	1834	LAKESIDE DRIVE	2010
HOBBS STREET	1566	LAKESIDE DRIVE	1764
HOBSON LANE	1844	LAKEVIEW ROAD	1376
HOCKADAY MILL	1162	LANCASTER DR	1817
HOGAN DRIVE	1822	LANGDON ROAD	1336
HOLLAND DRIVE	1950	LANSING DRIVE	1872
HOLLAND ROAD	1363	LASSITER POND	1338
HOLLY GROVE CH	1113	LASSITER ROAD	1335
HOLLYBROOK CIR	1837	LASSITER ROAD	1514
HOLTS POND ROAD	2530	LAZY BRANCH DR	1866
HOMESTEAD DR	2019	LEE DRIVE	1849
HOOD GROVE CHUR	1135	LEE ROAD	1561
HORNE STREET	1750	LEE STREET	1657
HOSPITAL ROAD	1921	LEEWAY COURT	1659
HUCKLEBERRY CIR	2183	LEGARE COURT	1859
HUNTERS POINT	1634	LEMA DRIVE	1685
HUNTERSBRIDGE D	1803	LIGHTFOOT DRIVE	1645
HUNTING LODGE R	1850	LILLIAN DR	1678
INNSBRUCK DRIVE	2005	LISA DRIVE	2412
INNSBRUCK DRIVE	2006	LIVE OAK CHURCH	1939
IRVAN STREET	1846	LIZZIE MILL RD	1001
J HOWELL	2165	LOBLOLLY CIRCLE	2033
J J RANCH ROAD	1560	LOMBARD STREET	1756
JASON CIRCLE	1647	LONG NEEDLE DR	2028
JEFFERY DINNER	1168	LOPEZ LN	2027
JESSICA STREET	2404	LUCHT ROAD	1230
JOHN'S COURT	1653	LUCKY TART ROAD	1174
JOHNSON ROAD	1533	LYNNFIELD LN	1625
JOHNSON STREET	1175	MAGNOLIA COURT	1673
JOHNSTON UNION	1563	MAIN STREET	1004
JONYER STREET	1568	MAIN STREET	2130
JOY STREET	1644	MALLARD ROAD	2507
JOYCE DRIVE	2185	MALLARD STREET	2559
JOYNER BRIDGE	1185	MALTA STREET	2506
JULIAN LANE	1838	MARKET STREET	1204
JUMP ROAD	2321	MARSHALL DRIVE	2558
JUNIPER CHURCH	1159	MASSENGILL MILL	1309
JUNIPER DRIVE	1984	MASSENGILL POND	1313



# Appendix E1 - Alphabetical SR List

Road Name	SR Number	Road Name	SR Number
MASSEY STREET	2505	PARRISH ROAD	1521
MASSEY-HOLT	2372	PARRISH ROAD	2361
MATTE ROAD	1582	PARRISH STREET	2394
MATTHEWS ROAD	1509	PARTRIDGE	2585
MCCOLL DRIVE	1833	PEACH ORCHARD	1148
MCCULLERS STR	1973	PEACH ORCHARD D	1842
MCCULLERS STR	1953	PEARIDGE ROAD	1313
MEADOW LANE	1763	PEARL STREET	2372
MEADOW LANE	1760	PEBBLE DRIVE	1787
MEADOWBROOK	1136	PEEDIN AVENUE	2309
MEADOWBROOK DR	2405	PHEASANT DR	1666
MEANDER WAY	1868	PHILLIPS STREET	1960
MILL CREEK RAOD	1188	PINE DRIVE	1238
MILLARD DR	1877	PINE KNOLL DR	2032
MILLSTONE DRIVE	1798	PINE LANE	1821
MITCHINER DRIVE	1999	PINE NEEDLE DR	1387
MOORE STREET	1710	PINE STREET	1233
MOORGATE DR	1680	PINE STREET	1002
MORGAN PARKWAY	2605	PINE STREET	2534
MORGAN ROAD	1211	PINEBARK LANE	1789
MORNING VIEW CT	1882	PINELAND AVENUE	1762
MOTORCYCLE RD	1704	PINEWOOD ROAD	1378
MUDDHOUND ROAD	1722	PINEY GROVE	1313
MULBERRY ROAD	1615	PINEY GROVE CHU	2385
MYRTLE LANE	1675	PITTMAN	2137
N. CHURCH ST	1377	PLAIN VIEW CHR	1313
NARRON ROAD	2169	PLEASANT HILL C	1305
NARRON ROAD	2172	POND STREET	1588
NEGRO ROAD	1506	PONY BARN ROAD	1570
NEW HOPE CHURCH	1109	POOL ROOM ROAD	1106
NORTH GROVE ST	1967	POPLAR ROAD	1913
NORTH JOHNSON	1369	POWELL DRIVE	2020
NORTH WILSON ST	2346	POWELL DRIVE	1966
NORTHEAST RR ST	1256	POWELL STREET	1977
NORTHWEST RR ST	1255	PRESTON STREET	2383
NOVEMBER LANE	1891	PRINCESS DRIVE	1619
OAK STREET	1929	PRINCETON ROAD	2141
OAK STREET	2397	PRISON CAMP RD	1900
OAK TREE DR	2018	PROTHAWN ROAD	1901
OCTOBER DRIVE	1889	QUAIL TRAIL	1627
OGBURN GIN ROAD	1579	QUEENS FERRY LN	1785
OGBURN ROAD	1541	RABDALL CHAPEL	1129
OLD BEULAH ROAD	1934	RAEFORD STREET	2304
OLD EVANS RD	1587	RAIFORD STREET	2395
OLD SANDERS HSE	1517	RAILROAD AVE	2536
OLD SR 1221	1208	RAILROAD AVENUE	2532
OLD US 70	2556	RAILROAD STREET	2324
ONEIL STREET	1708	RAILROAD STREET	2347
ORMOND	2525	RAILROAD STREET	2312
OVERSHOT ROAD	1136	RALEIGH ROAD	1360
PACE STREET	1948	RAND ROAD	1341
PACKING PLANT	1343	RASPBERRY CIRCL	2184
PALMER DR	2025	RAYMOND DRIVE	2603
PARRISH PIT RD	1305	RED CLOVER PL	1879



# Appendix E1 - Alphabetical SR List

Road Name	SR Number	Road Name	SR Number
RED OAK LANE	1637	STANLEY ROAD	1229
REDPATH DRIVE	1832	STEPHENSON ROAD	1322
REEDY POND CHUR	1124	STEPHENSON ROAD	1318
REMINGTON DRIVE	1880	STEPPING STONE	1865
RENFROW-NARRON	2116	STEVEN'S DAIRY	2508
RICHARDSON BRDG	1201	STILL MEADOWS	1873
RICHMOND DR	1776	STOCK'S MILL RD	1718
RICKS ROAD	2302	STONE LANE	1661
RIDER'S RDG. LN	1830	STONEBROOK DR	1660
RIDGE COURT	1772	STONEHENGE DR	1676
RIDGE DRIVE	1632	STREET A	2015
RIVER BEND DR	1773	STRICKLAND ST	1919
RIVER ROAD	1928	SUMMERBROOKE CT	1656
RIVERSTONE DR	2034	SURLES ROAD	1104
RIVERWOOD DRIVE	2601	SWEET GUM PL	1638
ROANOKE WAY	1795	SWIFT CREEK DR	1643
ROCK CIRCLE	1788	SYLVANIA PLANT	2398
ROCK PILLAR RD	1572	TALL PINES LN	1857
ROCKVALE COURT	1867	TALLY HO DRIVE	1774
ROLLING RIDGE	1874	TAMMY DRIVE	1642
ROSE DAIRY ROAD	1206	TARHEEL	1168
ROSE STREET	1589	TAYLOR MILL RD	1723
ROSEMARY STREET	1707	TECHNOLOGY DR	1800
ROYALTY COURT	1620	TEMPLE STREET	1165
RUSSELL DRIVE	1769	THIRD STREET	2531
RUSSET DR	1385	THIRD STREET	2535
SAINT JOHN CHUR	1196	TILGHMAN STREET	2379
SALEM CHURCH RD	1742	TIMBER COURT	2181
SANDLEBROOK DR	1845	TIMBER LANE	2031
SANGO ROAD	1553	TIMOTHY DRIVE	2562
SCOTT COURT	1658	TOLAR POND ROAD	1199
SEPTEMBER LANE	1890	TOPEKA LANE	1884
SEVEN OAKS DR	1779	TRADD COURT	1860
SHADOW LAKE DR	1662	TROTTERS RUN CT	1784
SHADY BOTTOM CT	1856	TULIP STREET	1590
SHADY LANE STR	1952	TWIN ACRES ROAD	1599
SHADY MEADOWS L	1854	TYLER DRIVE	1386
SHAW'S POND	1136	UNNAMED	1770
SHOEHEEL ROAD	1933	UNNAMED ROAD	1242
SLATE TOP HOUSE	1559	UNNAMED ROAD	2407
SLIPPERY BANK	1869	VALLEY CT	1790
SMITH DRIVE	1768	VILLAGE COURT	1626
SMITH ROAD	2553	VINEHILL COURT	1802
SMITHFIELD RD	1173	VINSON ROAD	1903
SNEAD DRIVE	2026	WAGON FARM RD	1415
SOUTHEAST RR ST	1257	WAKELINE DRIVE	1778
SOUTHGATE DRIVE	1655	WALKER RUN	2600
SOUTHMONT LANE	2602	WALKERS WAY	1831
SPRING VALLEY	1664	WALNUT STREET	1974
SPRINGFIELD CT	1852	WATSON ROAD	2142
ST MARY'S CH RD	2176	WEBB MILL ROAD	1153
STAGE ROAD	1006	WEBB STREET	2332
STALLINGS ST	1709	WELLONS ROAD	1537
STANCIL STREET	1963	WENDELL ROAD	1701



## Appendix E1 - Alphabetical SR List

Road Name	SR Number
WESTGATE CIRCLE	1383
WHISPERING PINE	2029
WHITE MEMORIAL	1532
WHITE OAK CIRCL	1635
WHITE OAK DRIVE	1988
WHITE PINE DR	1766
WHITE SUBDIV	1759
WHITETAIL LANE	1793
WHITLEY DRIVE	1955
WHITLEY WAY	2563
WILDBERRY CT	1665
WILKINS-O'NEAL	1254
WILKINS-O'NEAL	1154
WILLIAMS ROAD	1231
WILMINGTON ROAD	1330
WINCHESTER PLAC	1853
WINDWOOD COURT	1804
WINSTON ROAD	1550
WOODARD DRIVE	2408
WOODCREST DRIVE	1765
YELVERTON GROVE	2508
YELVERTON GROVE	2301
ZACKS MILL RD	1319



Name	SR #	Name	SR #
LIZZIE MILL RD	1001	ROSE DAIRY ROAD	1206
PINE STREET	1002	OLD SR 1221	1208
BUFFALOE ROAD	1003	MORGAN ROAD	1211
MAIN STREET	1004	DUNN STREET	1214
STAGE ROAD	1006	HARNETT STREET	1215
BROGDEN ROAD	1007	BREWER	1224
COX MILL RD	1008	BREWER	1225
DEVIL RACE TRCK	1009	STANLEY ROAD	1229
CLEVELAND ROAD	1010	LUCHT ROAD	1230
COUNTY LINE RD	1103	WILLIAMS ROAD	1231
SURLES ROAD	1104	KINSEY STREET	1232
POOL ROOM ROAD	1106	PINE STREET	1233
NEW HOPE CHURCH	1109	HARPER AVENUE	1237
HOLLY GROVE CH	1113	PINE DRIVE	1238
GODWIN LAKE RD	1116	BAKER STREET	1239
BRYANT POND RD	1119	KEEN STREET	1240
ELDRIDGE ROAD	1122	ELM STREET	1241
REEDY POND CHUR	1124	UNNAMED ROAD	1242
RABDALL CHAPEL	1129	WILKINS-O'NEAL	1254
HOOD GROVE CHUR	1135	NORTHWEST RR ST	1255
OVERSHOT ROAD	1136	NORTHEAST RR ST	1256
MEADOWBROOK	1136	SOUTHEAST RR ST	1257
SHAW'S POND	1136	BENSON ROAD	1303
PEACH ORCHARD	1148	PARRISH PIT RD	1305
WEBB MILL ROAD	1153	PLEASANT HILL C	1305
WILKINS-O'NEAL	1154	AQUILLA	1307
JUNIPER CHURCH	1159	ELEVATION ROAD	1308
HOCKADAY MILL	1162	MASSENGILL MILL	1309
TEMPLE STREET	1165	PEARIDGE ROAD	1313
DENNING	1168	PINEY GROVE	1313
TARHEEL	1168	MASSENGILL POND	1313
JEFFERY DINNER	1168	PLAIN VIEW CHR	1313
HANNA CRK CHUR	1171	STEPHENSON ROAD	1318
SMITHFIELD RD	1173	ZACKS MILL RD	1319
LUCKY TART ROAD	1174	GREENLEAF RD	1320
JOHNSON STREET	1175	GRAHAM POND RD	1321
FIVE POINTS RD	1176	STEPHENSON ROAD	1322
KEEN ROAD	1178	WILMINGTON ROAD	1330
KEEN STREET	1182	FEDERAL AID RD	1331
LAKE ROAD	1183	HICKORY GRVE CH	1333
JOYNER BRIDGE	1185	KING MILL ROAD	1334
MILL CREEK RAOD	1188	LASSITER ROAD	1335
SAINT JOHN CHUR	1196	LANGDON ROAD	1336
BENTONVILLE RD	1197	LASSITER POND	1338
TOLAR POND ROAD	1199	RAND ROAD	1341
RICHARDSON BRDG	1201	PACKING PLANT	1343
ALLEN STREET	1203	COUNTRY CLUB RD	1345
MARKET STREET	1204	BARBOUR CHAPEL	1348
FIRETOWER ROAD	1205	BURNELL CHURCH	1350



Name	SR #	Name	SR #
RALEIGH ROAD	1360	HARPER ROAD	1562
BYRDTOWN ROAD	1361	JOHNSTON UNION	1563
HOLLAND ROAD	1363	AMOS STREET	1564
NORTH JOHNSON	1369	CHAMPION STREET	1565
CAROLYN AVENUE	1370	HOBBS STREET	1566
CAROLYN AVENUE	1373	DAOMN STREET	1567
HILLCREST DRIVE	1375	JONYER STREET	1568
LAKEVIEW ROAD	1376	PONY BARN ROAD	1570
N. CHURCH ST	1377	ROCK PILLAR RD	1572
PINEWOOD ROAD	1378	OGBURN GIN ROAD	1579
WESTGATE CIRCLE	1383	MATTE ROAD	1582
RUSSET DR	1385	DAIRY ROAD	1583
TYLER DRIVE	1386	EVERETT AVENUE	1585
PINE NEEDLE DR	1387	OLD EVANS RD	1587
WAGON FARM RD	1415	POND STREET	1588
BUCKET JONES RD	1501	ROSE STREET	1589
COUNTY HOME RD	1502	TULIP STREET	1590
COUNTY HOME PIT	1503	ASTOR STREET	1591
CRANTOP ROAD	1504	FERNWOOD ROAD	1592
DICKERSON ROAD	1505	CLOVERDALE ROAD	1598
NEGRO ROAD	1506	TWIN ACRES ROAD	1599
BYRD ROAD	1507	ASHLEY DRIVE	1611
BEREA CHURCH RD	1508	CHAPEL DRIVE	1612
MATTHEWS ROAD	1509	EASON STREET	1613
BOOKER ROAD	1510	CAROL STREET	1614
LASSITER ROAD	1514	MULBERRY ROAD	1615
CLEVELAND FIRE	1515	BEECHWOOD DRIVE	1616
OLD SANDERS HSE	1517	BIRDIE DRIVE	1617
PARRISH ROAD	1521	DUCHESS DRIVE	1618
DRUG STORE ROAD	1524	PRINCESS DRIVE	1619
CORNWALLIS ROAD	1525	ROYALTY COURT	1620
KING ROAD	1531	DUKE STREET	1621
WHITE MEMORIAL	1532	LAKE EVA MARIE	1622
JOHNSON ROAD	1533	COUNTRY LANE RD	1623
WELLONS ROAD	1537	FORT DRIVE	1624
OGBURN ROAD	1541	LYNNFIELD LN	1625
CARROLL ROAD	1543	VILLAGE COURT	1626
AIRPORT ROAD	1544	QUAIL TRAIL	1627
AUSTIN POND RD	1549	RIDGE DRIVE	1632
WINSTON ROAD	1550	CREEK VIEW DR	1633
AMELIA CHURCH	1552	HUNTERS POINT	1634
SANGO ROAD	1553	WHITE OAK CIRCL	1635
FOX LANE	1554	CEDAR COURT	1636
BARBOUR ROAD	1555	RED OAK LANE	1637
GOVERNMENT ROAD	1556	SWEET GUM PL	1638
BIG PINE ROAD	1558	HEMLOCK PLACE	1639
SLATE TOP HOUSE	1559	TAMMY DRIVE	1642
J J RANCH ROAD	1560	SWIFT CREEK DR	1643
LEE ROAD	1561		



Name	SR #	Name	SR #
JOY STREET	1644	ONEIL STREET	1708
LIGHTFOOT DRIVE	1645	STALLINGS ST	1709
JUSTIN DRIVE	1646	MOORE STREET	1710
JASON CIRCLE	1647	LAKE WENDELL RD	1716
BRIAN COURT	1648	CLYDE CHAPEL RD	1717
KERRI DRIVE	1649	STOCK'S MILL RD	1718
KRISTI DRIVE	1650	MUDDHOUND ROAD	1722
KASEY,S CIRCLE	1651	TAYLOR MILL RD	1723
CHRIS COURT	1652	HARRIS-WILSON	1725
JOHN'S COURT	1653	ANTIOCH CHURCH	1733
BEN,S CIRCLE	1654	SALEM CHURCH RD	1742
SOUTHGATE DRIVE	1655	CAMP ATKINSON	1749
SUMMERBROOKE CT	1656	HORNE STREET	1750
LEE STREET	1657	CAMEL STREET	1751
SCOTT COURT	1658	COOPER STREET	1752
LEEWAY COURT	1659	CAMEL STREET	1753
STONEBROOK DR	1660	DAVIS ROAD	1754
STONE LANE	1661	ATKINSON STREET	1755
SHADOW LAKE DR	1662	LOMBARD STREET	1756
LAKESIDE CIR	1663	WHITE SUBDIV	1759
SPRING VALLEY	1664	MEADOW LANE	1760
WILDBERRY CT	1665	HILLCREST LANE	1761
PHEASANT DR	1666	PINELAND AVENUE	1762
CROSSWINDS DR	1667	MEADOW LANE	1763
COVEY LANE	1667	LAKESIDE DRIVE	1764
DOVE CT	1668	WOODCREST DRIVE	1765
ALEX AVE	1669	WHITE PINE DR	1766
BIRCH LANE	1672	DERBY CIRCLE	1767
MAGNOLIA COURT	1673	SMITH DRIVE	1768
DOUGLAS STREET	1674	RUSSELL DRIVE	1769
CYPRESS COURT	1674	UNNAMED	1770
MYRTLE LANE	1675	FOREST ROAD	1771
STONEHENGE DR	1676	RIDGE COURT	1772
HEMLOCK CIRCLE	1677	RIVER BEND DR	1773
LILLIAN DR	1678	TALLY HO DRIVE	1774
HEATHER DOWNS L	1679	RICHMOND DR	1776
MOORGATE DR	1680	BRISTOL CIRCLE	1777
COACHMAN CT	1681	WAKELINE DRIVE	1778
FIELDSTONE LN	1682	SEVEN OAKS DR	1779
BARCLAY LN	1683	DIXIE COURT	1780
DEER RUN	1684	ANNIE V DRIVE	1781
LEMA DRIVE	1685	DUBA COURT	1782
CRESTWOOD COURT	1686	BRIDGE LANE	1783
CRESTWOOD DRIVE	1687	TROTTERS RUN CT	1784
BRIGHT LEAF DR	1688	QUEENS FERRY LN	1785
CHARLIE LANE	1692	FIELDSTONE DR	1786
CNTRY TRAILS DR	1699	PEBBLE DRIVE	1787
COVER BRIDGE RD	1700	ROCK CIRCLE	1788
WENDELL ROAD	1701	PINEBARK LANE	1789
MOTORCYCLE RD	1704	VALLEY CT	1790
ROSEMARY STREET	1707	DEERFIELD TRAIL	1791



Name	SR #	Name	SR #
BUCKHORN LANE	1792	TRADD COURT	1860
WHITETAIL LANE	1793	CANTERBURY RD	1861
CHATHAM CT	1794	ESSEX LANE	1862
ROANOKE WAY	1795	CREEKSTONE DR	1863
ABBINGTON CT	1796	DEEP POOL CT	1864
FAWN LANE	1797	STEPPING STONE	1865
MILLSTONE DRIVE	1798	LAZY BRANCH DR	1866
DOE LANE	1799	ROCKVALE COURT	1867
TECHNOLOGY DR	1800	MEANDER WAY	1868
ENGLEWOOD DRIVE	1801	SLIPPERY BANK	1869
VINEHILL COURT	1802	AUTUMN DRIVE	1870
HUNTERSBRIDGE D	1803	LANSING DRIVE	1872
WINDWOOD COURT	1804	STILL MEADOWS	1873
GREYBRIDGE CT	1805	ROLLING RIDGE	1874
COBBLESTONE CT	1806	HIKING TRAIL	1875
CEDARWOOD CT	1807	DUANNE POOL RD	1876
LANCASTER DR	1817	MILLARD DR	1877
CARL CIRCLE	1818	ALFLFA CT	1878
APPLEWOOD DRIVE	1820	RED CLOVER PL	1879
PINE LANE	1821	REMINGTON DRIVE	1880
HOGAN DRIVE	1822	AMBER LANE	1881
GLENN STREET	1828	MORNING VIEW CT	1882
GRANT ST	1829	CAROLINA AVENUE	1883
RIDER'S RDG. LN	1830	TOPEKA LANE	1884
WALKERS WAY	1831	CHANDLER COURT	1885
REDPATH DRIVE	1832	DANBURY COURT	1886
MCCOLL DRIVE	1833	AUTUMN WOODS LN	1887
HILLINGTON RD	1834	DECEMBER COURT	1888
CLARENDON CT	1835	OCTOBER DRIVE	1889
BROOKFIELD CT	1836	SEPTEMBER LANE	1890
HOLLYBROOK CIR	1837	NOVEMBER LANE	1891
JULIAN LANE	1838	PRISON CAMP RD	1900
BRETT CIRCLE	1839	PROTHAWN ROAD	1901
PEACH ORCHARD D	1842	VINSON ROAD	1903
HARRIS ROAD	1843	GORDON	1905
HOBSON LANE	1844	POPLAR ROAD	1913
SANDLEBROOK DR	1845	STRICKLAND ST	1919
IRVAN STREET	1846	HOSPITAL ROAD	1921
BRADLEY DRIVE	1847	BOOKER DAIRY RD	1923
BRANDY COURT	1848	ANDERSON STREET	1927
LEE DRIVE	1849	RIVER ROAD	1928
HUNTING LODGE R	1850	OAK STREET	1929
COLT CIRCLE	1851	SHOEHEEL ROAD	1933
SPRINGFIELD CT	1852	OLD BEULAH ROAD	1934
WINCHESTER PLAC	1853	LIVE OAK CHURCH	1939
SHADY MEADOWS L	1854	PACE STREET	1948
GRANT STREET	1855	CENTER STREET	1949
SHADY BOTTOM CT	1856	HOLLAND DRIVE	1950
TALL PINES LN	1857	SHADY LANE STR	1952
CHALMERS DRIVE	1858	MCCULLERS STR	1953
LEGARE COURT	1859	WHITLEY DRIVE	1955



Name	SR #	Name	SR #
BRITT STREET	1956	CHRISTIAN ST	2035
FLOWERS STREET	1959	BROOKGREEN DR	2036
PHILLIPS STREET	1960	FOX HOLLOW DR	2037
STANCIL STREET	1963	FOX HOLLOW DR	2038
EDGERTON STREET	1964	CARIBOU LANE	2039
FLOWERS DRIVE	1965	FRIENDSHIP CHUR	2102
POWELL DRIVE	1966	RENFROW-NARRON	2116
NORTH GROVE ST	1967	BAILEY-BOYKIN	2125
HARTLEY STREET	1972	MAIN STREET	2130
MCCULLERS STR	1973	PITTMAN	2137
WALNUT STREET	1974	DAVIS HOMESTEAD	2137
EASON DRIVE	1975	PRINCETON ROAD	2141
DAUGHTRY STREET	1976	WATSON ROAD	2142
POWELL STREET	1977	BAGLEY ROAD	2144
FARMPATH ROAD	1981	DEBRO	2152
COATS STREET	1982	J HOWELL	2165
HICKORY DRIVE	1983	GOLDSBORO ST	2167
JUNIPER DRIVE	1984	NARRON ROAD	2169
COTTONWOOD DRIV	1985	ALFORD AVENUE	2171
GREENMEADOW DRI	1986	NARRON ROAD	2172
EVERGREEN CIRC	1987	ST MARY'S CH RD	2176
WHITE OAK DRIVE	1988	DOGWOOD DRIVE	2179
DANIEL DRIVE	1994	DAVIS FARM DR.	2180
COMPUTER DRIVE	1997	TIMBER COURT	2181
CATAWBA DRIVE	1998	BLUEBERRY DRIVE	2182
MITCHINER DRIVE	1999	HUCKLEBERRY CIR	2183
CREEKSIDE DRIVE	2001	RASPBERRY CIRCL	2184
INNSBRUCK DRIVE	2005	JOYCE DRIVE	2185
INNSBRUCK DRIVE	2006	YELVERTON GROVE	2301
ALPINE WAY	2007	RICKS ROAD	2302
FOX RIDGE ROAD	2008	RAEFORD STREET	2304
DEERHAVEN LANE	2009	PEEDIN AVENUE	2309
LAKESIDE DRIVE	2010	DAVIS MILL RD	2310
COLONIAL DRIVE	2013	RAILROAD STREET	2312
GREEN PATH	2014	JUMP ROAD	2321
STREET A	2015	RAILROAD STREET	2324
CAR MIL DRIVE	2016	WEBB STREET	2332
OAK TREE DR	2018	GOODLING	2338
HOMESTEAD DR	2019	COLLEGE STREET	2342
POWELL DRIVE	2020	CRUMPLER	2345
BRIARWOOD DRIVE	2024	NORTH WILSON ST	2346
PALMER DR	2025	RAILROAD STREET	2347
SNEAD DRIVE	2026	PARRISH ROAD	2361
LOPEZ LN	2027	FULGHUM LIT CRK	2366
LONG NEEDLE DR	2028	PEARL STREET	2372
WHISPERING PINE	2029	MASSEY-HOLT	2372
CONE CIRCLE	2030	EDWARDS	2372
TIMBER LANE	2031	BLANCHE STREET	2374
PINE KNOLL DR	2032	TILGHMAN STREET	2379
LOBLOLLY CIRCLE	2033	PRESTON STREET	2383
RIVERSTONE DR	2034	PINEY GROVE CHU	2385



Name	SR #
PARRISH STREET	2394
RAIFORD STREET	2395
CHERRY STREET	2396
OAK STREET	2397
SYLVANIA PLANT	2398
ALLIED MILLS	2400
JESSICA STREET	2404
MEADOWBROOK DR	2405
GOR-AN ROAD	2406
EAST GORDON	2406
UNNAMED ROAD	2407
WOODARD DRIVE	2408
LISA DRIVE	2412
DR MAR LUT KING	2502
BELMONT STREET	2502
HARRIS STREET	2503
COLLIER STREET	2504
MASSEY STREET	2505
MALTA STREET	2506
MALLARD ROAD	2507
STEVEN'S DAIRY	2508
YELVERTON GROVE	2508
DAUGHTRY ROAD	2514
BRASWELL ROAD	2521
ORMOND	2525
HOLTS POND ROAD	2530
THIRD STREET	2531
RAILROAD AVENUE	2532
PINE STREET	2534
THIRD STREET	2535
RAILROAD AVE	2536
GRABTOWN ROAD	2543
SMITH ROAD	2553
KING DRIVE	2555
OLD US 70	2556
MARSHALL DRIVE	2558
MALLARD STREET	2559
TIMOTHY DRIVE	2562
WHITLEY WAY	2563
BONNIE AVENUE	2583
LAKE VISTA DR	2584
PARTRIDGE	2585
DEER DRIVE	2586
WALKER RUN	2600
RIVERWOOD DRIVE	2601
SOUTHMONT LANE	2602
RAYMOND DRIVE	2603
CASPER COURT	2604
MORGAN PARKWAY	2605
CLYDESDALE DR	2606



# Appendix F







# **Appendix F**

## **Transportation Improvement Program**

### **Project Request Process**

The process for requesting projects to be included in the Transportation Improvement Program (TIP) is described briefly in this appendix.

The local representatives should first decide which projects from the thoroughfare plan they would like funded in the TIP. A TIP request for a few carefully selected projects is likely to be more effective than requesting all the projects proposed in the thoroughfare plan. These projects should be prioritized by the local representatives and summarized briefly, as shown on Appendix Page F-3.

After determining which projects are the highest priority for the area, a TIP project request should be sent to the Board of Transportation Member from the municipality's or county's respective district. The TIP project request should include a letter with a prioritized summary of requested projects, as well as a TIP candidate project request form and a project location map for each project. An example of each of these items is included in this appendix.



# Example

\* *Note: This is not an official request submitted to the Board of Transportation. This is intended to be an example of a Transportation Improvement Program (TIP) Request.*

*Month ##, Year*

North Carolina Board Member  
N. C. Board of Transportation  
N. C. Department of Transportation  
P. O. Box 25201  
Raleigh, NC 27611-5201

Dear Board Member:

SUBJECT: 2000-2006 TIP Project Requests for *Generic* County

Enclosed find the projects requested by *Generic* County for consideration in the next TIP update. The list is presented by priority, as approved by the *Generic* County Commissioners at their *Month* meeting.

*Generic* County also endorsed the existing schedule of projects contained in the current TIP for the county, with one request. The county requests that TIP Project R-XXXX remain as a high priority and kept on the existing schedule.

We thank you for the opportunity to participate in development of the State TIP. Please contact us immediately if additional information is needed concerning any of the enclosed project requests.

Sincerely,

*John Q. Public*

cc: Division Engineer  
Enclosure



*Generic County*  
**County Commissioners**  
**2000 Proposed Highway Projects (Final)**

1) **SR 1111 (Town Street) & SR 1112 (Industry Drive) TIP Project R-XXXX**

- From SR 1113 (Country Road) to NC 11
- Widen roadway to a multilane facility, with some new location

2) **US 11**

- From SR 1112 (Industry Drive) to SR 1113 (Country Road)
- Widen roadway to a multilane facility

3) **NC 11**

- From SR 1114 (Any Road) to the existing four lane section just south of I-85
- Widen roadway to a multilane facility

4) **US 11 Business (Business Road)**

- From SR 1115 (Some Road) to NC 12
- Widen facility to a five lane cross section

5) **New Connector**

- From US 11 to US 112 Business (City Street)
- New Facility



**Highway Program  
TIP Candidate Project Request**

( Please Provide Information if Available)

Date ##/##/## Priority No. #

County Generic City/Town

Requesting Agency County Commissioners NCTIP No. R-####  
(if available)

Route (US, NC, SR/Local Name) SR 1111(Town Street) and SR 1112(Industry Drive)

Project Location (From/To/Length) From SR 1113 (Country Road) to NC 11,  
## miles

Type of Project (Widening, New Facility, Bridge Replacement, Signing, Safety, Rail Crossing, Bicycle, Enhancement, etc.)

Widen roadway to a multi-lane facility, with some new location.

Existing Cross Section 24 Feet, Type

Existing Row 60 to 80 Feet Existing ADT 8,000 (1996)

Estimated Cost, ROW \$ 900,000 Construction \$ 4,000,000

Brief Justification for Project As a major thoroughfare, this facility carries increasing traffic volumes between the industrial sites along this route to NC 11 and the I-85 corridor. In the adopted thoroughfare plan for Generic County, it is recommended that this facility should be widen to a multi-lane cross section due to the increasing volume and the potential for more development in this area. The county requests that this project continue to be funded.

Project Supported By (Agency/Group)

Other Information/ Justification

- ☒ Part of Thoroughfare Plan  
☐ Part of Comprehensive Plan  
☐ Serves School  
☐ Serves Hospital

- ☐ Obsolete Facility  
☐ Serves Park  
☐ High Accident (#       )  
☐

(Please Attach Map Showing Project Location)



# HIGHWAY PROGRAM

# JOHNSTON COUNTY

ROUTE/CITY	ID NO.	LOCATION AND DESCRIPTION	LENGTH (MI) (KM)	TOTAL EST. COST (THOU.)	PRIOR YRS. COST (THOU.)	WORK TYPE	FUNDING ESTIMATES SOURCE	COST (THOU.)	SCHEDULE (FISCAL YEARS)
I-40	I-4008	WAKE COUNTY LINE TO SAMPSON COUNTY LINE. INSTALL MEDIAN GUARDRAIL.	29.6 47.7	1350	100	DESIGN CONSTRUCTION	IM	1250	IN PROGRESS FFY 01
I-95	I-2703	HARNETT COUNTY LINE TO US 70 (EXIT 97). PAVEMENT, BRIDGE REHABILITATION AND SAFETY IMPROVEMENTS OF I-2731 AND I-2732 BETWEEN THE HARNETT AND WILSON COUNTY LINES.	19.0 30.6	38779	8979	CONSTRUCTION PART COMPLETE	IM	29800	POST YEARS PART UNFUNDED
I-95	I-2704	FOUR OAKS, SR 1178 (KEEN ROAD), EXIT 87. INTERCHANGE MODIFICATION.		5800	600	DESIGN RIGHT-OF-WAY CONSTRUCTION CONSTRUCTION	IM HP IM	2000 3000 200	IN PROGRESS FFY 01 FFY 02 FFY 02
I-95	I-2812	NC 50 (EXIT 79). REVISE INTERCHANGE TO A DIAMOND. LIGHT AND EXTEND SPEED/AUXILIARY LANES ON I-95 BETWEEN NC 50 (EXIT 79) AND I-40 TO FORM CONTINUOUS LANES.	1.2 1.9	9549	9549	UNDER CONSTRUCTION			
I-95	I-3318	US 70 (EXIT 97) TO US 301 (EXIT 107). PAVEMENT AND BRIDGE REHABILITATION.	10.7 17.2	36028	9728	CONSTRUCTION PART UNDER CONSTRUCTION	IM	26300	POST YEARS
US 64, US 70, US 117, US 158, US 264	R-4418	NATIONAL HIGHWAY SYSTEM GUARDRAIL REHABILITATION. UPGRADE SUBSTANDARD GUARDRAIL, END TREATMENTS AND BRIDGE ANCHOR UNITS.	158.9 255.9	310		DESIGN CONSTRUCTION	NHS	310	FY 05 FFY 06
US 70	R-2552 *	CLAYTON BYPASS, I-40 TO US 70-70 BUSINESS. FREEWAY ON NEW LOCATION.	9.5 15.3	124768	14493	DESIGN RIGHT-OF-WAY RIGHT-OF-WAY RIGHT-OF-WAY CONSTRUCTION CONSTRUCTION CONSTRUCTION	BI NHS NHS T T	4900 1575 24500 71025 8275	IN PROGRESS PART IN ACQUISITION SFY 01 FFY 02 FFY 04 SFY 04 05 06 POST YEARS
NC 42	R-3825	US 70 TO SR 1003 (BUFFALO ROAD). WIDEN TO MULT-LANES.	6.0 9.7	21700	500	PLANNING DESIGN RIGHT-OF-WAY CONSTRUCTION RIGHT-OF-WAY CONSTRUCTION		700 4100 2300 14100	IN PROGRESS FY 01 FFY 03 FFY 04 POST YEARS POST YEARS
NC 42	R-3848	SR 1525 (CORNWALLIS ROAD). WIDEN TO PROVIDE LEFT TURN LANES AND REVISE TRAFFIC SIGNAL.	0.8 1.3	592	592	UNDER CONSTRUCTION			
SR 1178 KEEN ROAD	R-4071	I-95 TO US 301. WIDEN TO THREE LANES WITH CURB AND GUTTER.	0.4 0.6	1410		PLANNING DESIGN RIGHT-OF-WAY CONSTRUCTION	STP STP STP STP	360 1050	IN PROGRESS FY 02 FFY 03 FFY 05

\* INDICATES INTRASTATE PROJECT



# HIGHWAY PROGRAM

## JOHNSTON COUNTY

ROUTE/CITY	ID NO.	LOCATION AND DESCRIPTION	LENGTH (MI) (KM)	TOTAL EST. COST (THOU.)	PRIOR YRS. COST (THOU.)	WORK TYPE	FUNDING SOURCE	COST ESTIMATES (THOU.)	SCHEDULE (FISCAL YEARS)
SMITHFIELD	U-3334	EXTENSION OF SR 1923 (BOOKER DAIRY ROAD), US 70 BUSINESS WEST OF SMITHFIELD TO US 301 (BRIGHT- LEAF BOULEVARD). TWO LANES, PART ON NEW LOCATION.	3.7 6.0	10550	200	PLANNING DESIGN RIGHT-OF-WAY CONSTRUCTION	STP STP	1800 8550	IN PROGRESS FY 01 FFY 02 07 FFY 04 08
US 70 BUSINESS	B-3864	NEUSE RIVER. REPLACE BRIDGE NO. 40		3500	420	RIGHT-OF-WAY CONSTRUCTION	FA	280	FFY 05
US 70	B-4555	SOUTHERN RAILWAY. REPLACE BRIDGE NO. 97		3300		RIGHT-OF-WAY CONSTRUCTION	FA	300	FFY 06
NC 50	B-3197	BLACK CREEK OVERFLOW. REPLACE BRIDGE NO. 61		1157	1157	UNDER CONSTRUCTION		3000	FFY 08
NC 50	B-4556	BLACK CREEK. REPLACE BRIDGE NO. 74		550		RIGHT-OF-WAY CONSTRUCTION	FA	50	FFY 06
NC 96	B-3481	LITTLE RIVER. REPLACE BRIDGE NO. 94		764	90	RIGHT-OF-WAY CONSTRUCTION	FA	44	FFY 01
NC 96	B-3669	HANNAH CREEK. REPLACE BRIDGE NO. 60		605	110	RIGHT-OF-WAY CONSTRUCTION	FA	630	FFY 02
NC 96	B-4164	LITTLE SWAMP. REPLACE BRIDGE NO. 52		660		RIGHT-OF-WAY CONSTRUCTION	FA	45	FFY 02
SR 1002	B-3865	LITTLE RIVER. REPLACE BRIDGE NO. 212		1365	165	RIGHT-OF-WAY CONSTRUCTION	FA	600	FFY 05
SR 1120 SR 1723	B-3213	MOCCASIN CREEK. REPLACE BRIDGE NO. 48		535	535	UNDER CONSTRUCTION		100	FFY 02
SR 1162	B-4165	SASSARIXA SWAMP. REPLACE BRIDGE NO. 89		550		RIGHT-OF-WAY CONSTRUCTION	NFA	1100	FFY 03
SR 1171	B-2991	BRANCH OF HANNAH CREEK. REPLACE BRIDGE NO. 77		582	582	UNDER CONSTRUCTION		50	FFY 05
SR 1229	B-3670	BERNAL CREEK. REPLACE BRIDGE NO. 448		325	75	RIGHT-OF-WAY CONSTRUCTION	NFA	500	FFY 06
SR 1309	B-3198	BLACK CREEK. REPLACE BRIDGE NO. 115		685	685	UNDER CONSTRUCTION		25	FFY 02
SR 1309	B-4557	BIG BRANCH. REPLACE BRIDGE NO. 113 WITH A CULVERT		275		RIGHT-OF-WAY CONSTRUCTION	NFA	225	FFY 03
SR 1330	B-3671	MIDDLE CREEK. REPLACE BRIDGE NO. 124		1000	1000	UNDER CONSTRUCTION		25	FFY 07
SR 1330	B-4558	STONE FORK CREEK. REPLACE BRIDGE NO. 86		495		RIGHT-OF-WAY CONSTRUCTION	NFA	250	FFY 08
								45	FFY 06
								450	FFY 07

\* INDICATES INTRASTATE PROJECT



# HIGHWAY PROGRAM

# JOHNSTON COUNTY

ROUTE/CITY	ID NO.	LOCATION AND DESCRIPTION	LENGTH (MI) (KM)	TOTAL EST. COST (THOU.)	PRIOR YRS. COST (THOU.)	WORK TYPE	FUNDING SOURCE	ESTIMATES (THOU.)	COST	SCHEDULE (FISCAL YEARS)
SR 1330	B-4559	BLACK CREEK. REPLACE BRIDGE NO. 84		990		RIGHT-OF-WAY CONSTRUCTION	NFA	90	FFY 06	
SR 1331	B-4560	BLACK CREEK. REPLACE BRIDGE NO. 102		770		RIGHT-OF-WAY CONSTRUCTION	NFA	70	FFY 06	
SR 1525	B-4561	SWIFT CREEK. REPLACE BRIDGE NO. 147		880		RIGHT-OF-WAY CONSTRUCTION	NFA	80	FFY 07	
SR 1553	B-3199	BRANCH. REPLACE BRIDGE NO. 188		443	150	RIGHT-OF-WAY CONSTRUCTION	NFA	23	FFY 01	
SR 1718	B-3672	BUFFALO CREEK. REPLACE BRIDGE NO. 415		705	110	RIGHT-OF-WAY CONSTRUCTION	NFA	45	FFY 02	
SR 1722	B-3863	LITTLE RIVER. REPLACE BRIDGE NO. 151		660		RIGHT-OF-WAY CONSTRUCTION	NFA	60	FFY 03	
SR 1733	B-4166	LITTLE RIVER. REPLACE BRIDGE NO. 170		550		RIGHT-OF-WAY CONSTRUCTION	NFA	50	FFY 03	
SR 2143	B-4562	LITTLE BUFFALO CREEK. REPLACE BRIDGE NO. 216		550		RIGHT-OF-WAY CONSTRUCTION	NFA	50	FFY 07	
SR 2320	B-3482	LITTLE RIVER. REPLACE BRIDGE NO. 224 LITTLE RIVER OVERFLOW. REPLACE BRIDGE NO. 447		1320	90	RIGHT-OF-WAY CONSTRUCTION	NFA	30	FFY 01	
I-95	K-3806	RENOVATION OF REST AREA EXTERIOR LIGHTING SYSTEM.		150		CONSTRUCTION	IM	150	FFY 01	
I-95	K-4402	RENOVATION OF BUILDINGS AND GROUNDS FOR PAIR OF REST AREAS TO INCLUDE DUAL RESTROOMS AND ADA COMPLIANT SINGLE RESTROOM.		1000		CONSTRUCTION	IM	1000	FFY 04	
US 70	W-4409	NC 42 INTERCHANGE TO EAST OF SR 1553 (SHOTWELL ROAD). WIDEN US 70 WESTBOUND TO THREE LANES WITH APPROPRIATE SHOULDER WIDENING.		925		CONSTRUCTION CONSTRUCTION BY DIVISION	HES	925	FFY 01	
SR 1004	W-4005	INTERSECTION WITH SR 1553. WIDEN APPROACHES OF SR 1004 AND THE EASTERN LEG OF SR 1553 FOR LEFT TURN LANES. WIDEN THE WESTERN LEG OF SR 1553 TO 36 FEET AND SIGNALIZE INTERSECTION.		614	614	UNDER CONSTRUCTION				
PRINCETON	W-4029	US 70 BYPASS AND SR 1002 (NORTH PINE STREET - RAINS MILL ROAD). REMOVE TRAFFIC ISLAND ON SR 1002 TO PROVIDE LEFT TURN LANE. WIDEN FOR RIGHT TURN LANE WITH TAPER AND REVISE SIGNAL.		20	20	UNDER CONSTRUCTION				

\* INDICATES INTRASTATE PROJECT

4-10

ALL SCHEDULES SUBJECT TO AVAILABILITY OF FUNDS







# Appendix G







# JOHNSTON COUNTY THOROUGHFARE PLAN DROP-IN SESSION SURVEY

*Please complete this survey after you have discussed the thoroughfare plan with NCDOT and the Johnston County representatives.*

Do you support the concept of looking at long range transportation needs for the community in a comprehensive manner? Yes\_\_\_\_ No\_\_\_\_  
Why or why not?

Do you disagree with any of the recommendations made for the Johnston County Thoroughfare Plan? Yes\_\_\_\_ No\_\_\_\_

If so, Which one(s)? And Why?

*Please Turn to the Back of this Page*



What is the key transportation problem in Johnston County (ie..NC 42, US 70)?

Will this problem be taken care of with the recommendations that were made?

If you have any additional comments or questions that were not answered in the drop in session, please include the question, your name & address, and it will be answered as soon as possible.

NCDOT and the Johnston County Planning Department would like to thank you for completing this survey. Your input will help guide Thoroughfare Plan recommendations and improvements. Please be reminded that the recommendations you have seen are based on current information. The project must be environmentally analyzed and checked for roadway design standards before a final roadway configuration is decided upon.

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**Please place completed surveys in the box provided.**

or mail by September 20, 1999 to:

Rhett Fussell, NCDOT Statewide Planning Branch, P.O. Box 25201, Raleigh NC 27611



# Sign-In for Johnston County Thoroughfare Plan Hearing

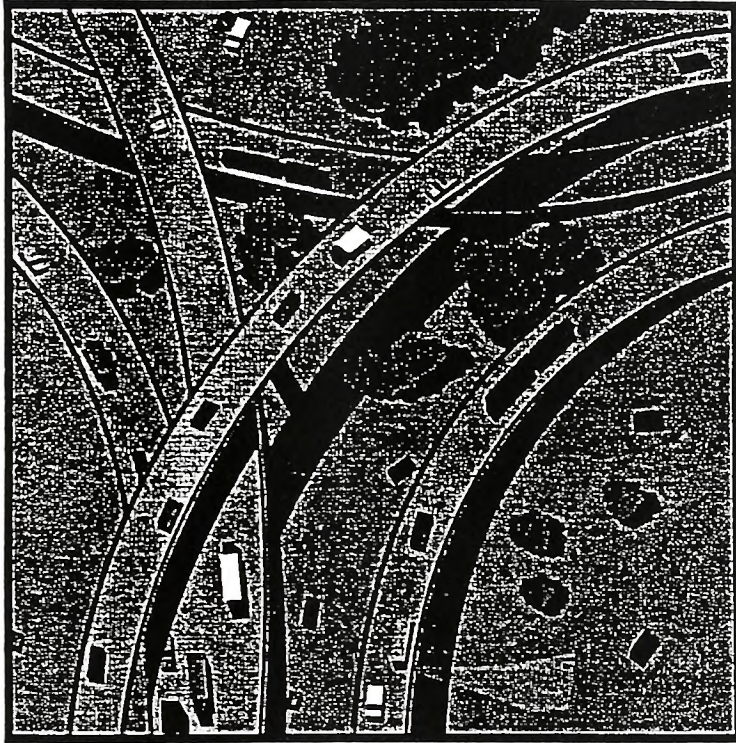
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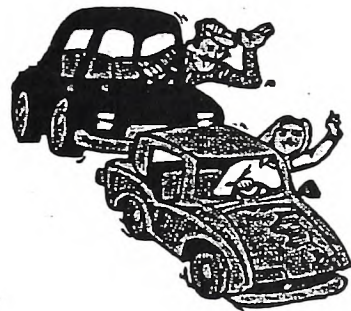




# WHAT IS THOROUGHFARE PLANNING?



HOW WILL IT HELP  
JOHNSTON COUNTY??






## What is Thoroughfare Planning?


**Thoroughfare planning** is the process of developing a long range plan of action for the roadway system in an area. The **main purpose** of a thoroughfare plan **is to ensure that the roadway system will be able to meet the needs of a community or region as land develops and traffic volumes increase**. Planning now for future transportation needs reduces unnecessary costs and disruption to citizens, businesses, and the environment. A Thoroughfare Plan is a tool by the local government to plan for future transportation needs, while keeping negative impacts to a minimum.


## How is a Thoroughfare Plan Developed?


The development of a thoroughfare plan is a highly detailed process that requires numerous types of data and coordination from a wide variety of individuals.


Data collection is initiated early in the course of the study and usually continues throughout the remainder of the study. Various types of data required for the completion of a thoroughfare plan include the following:

 Input from local government and staff. The local staff is critical in helping to determine the extent of the planning area, which is usually the current town limits plus any land that is expected to become developed within the 25 year planning period. Another task that requires local input and coordination is the prediction of future employment and housing for the planning area.

 Socio-economic data, such as current housing and employment data in the planning area. Usually counted by driving every street in the area and "rating" each house (ie..average, poor, etc.)

 The locations of high accident intersections within the planning area, which often pinpoint problems such as poor design, inadequate signing, ineffective parking, or poor sight distance on the roadway.

 Environmental and cultural concerns within the planning area, which usually include air quality, water resources, soils and geology, wildlife, vegetation, housing and neighborhoods, noise, educational facilities, churches, parks and recreational facilities, historic sites, and public health and safety.

 Transportation Improvement Program (TIP) projects within the planning area. The TIP documents all major construction projects to be undertaken by the NCDOT for the next seven years.



The data that is collected is used to create a computer model of the existing roadway system in Johnston County. This computer model (called a "network") includes all major roadways that serve the area (NC 42 & I 40...etc), as well as any other roads that are required to reasonably represent what roads people are driving upon( Cleveland School Road). The amount of traffic on a roadway is related to the following factors:



The population in the area

The businesses located along the road

The location of the major neighborhoods in the area

Therefore, the collected socio-economic data ( houses and businesses) is put into the computer in order to get traffic to represent the vehicles that are using the roads in Johnston County. Once the model has the same numbers of vehicles that have been counted traveling on the roads in 1995, the number of houses and businesses is then projected twenty-five years into the future. The number of houses and businesses that are predicted for Johnston County in the future, help determine how much traffic will be on each road in the future. Once we know how many vehicles will be on NC 42 , US 70 and the other roads, we can determine if there are problems with the roads or intersections in the area. This look at "problem areas" is called deficiency analysis.

***The next step in this process is the actual development of a Recommended Thoroughfare Plan for Johnston County.*** The problems that were discovered in Johnston County are investigated for possible solutions. These solutions may include as roadway widenings, new roads, and intersection improvements (adding turning lanes, stoplights) or non-building solutions like transit improvements, carpooling, signal timing. Once preliminary solutions have been determined, they are presented to the local staff and policy boards to ensure that the local objectives are being met, and a Recommended Thoroughfare Plan is agreed upon.

The Recommended Thoroughfare Plan is presented to the public through workshops and hearings, and presented to the local government for adoption. Once it has been adopted locally, the Thoroughfare Plan is presented to the NCDOT Board of Transportation for adoption.



## **How is the Thoroughfare Plan Used Once it is Adopted?**

*The Thoroughfare Plan is a map that shows the existing and anticipated roadway improvements for Johnston County. Using this plan is an important part of the transportation planning process. The plan should be used by Johnston County as technical support when requesting projects from the Board of Transportation, the Division Engineer, or at the Transportation Improvement Program (TIP) hearings held each fall. The county should also use the Thoroughfare Plan when developing land use, park and recreation, or area comprehensive plans, or when making policy decisions, such as subdivision approvals. This will help guarantee that new developments are in agreement with the future roads.*

## **2002- 2009 Transportation Improvement Program**

The Transportation Improvement Program (TIP) is a document which lists all major construction projects to be undertaken by the NCDOT for the next seven years. The projects included in the TIP are matched with projected funding sources. The TIP is updated every other year by removing those projects which have been constructed, advancing those which are currently included, and adding new projects for which funds are available.

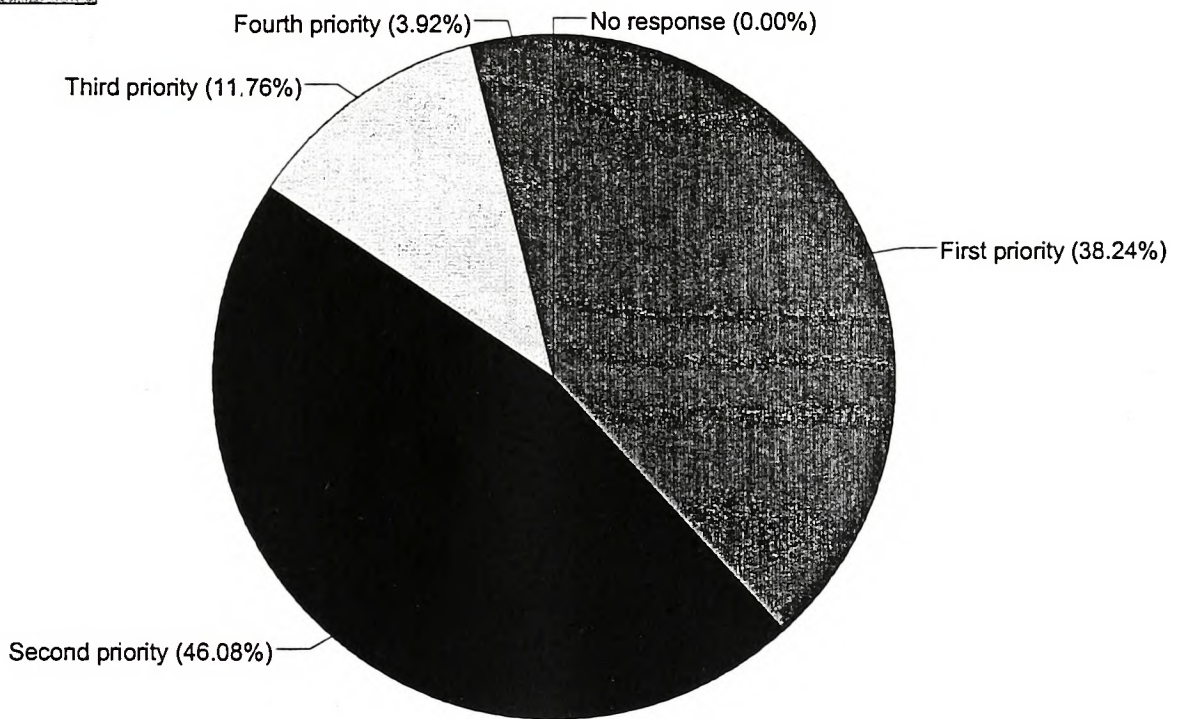
Johnston County will present a list of prioritized projects they would like to see built by the NCDOT in the fall of 1999. The TIP draft will be available for public comment from July 2000-April 2001 and a copy can be found on the internet as well as in the Johnston County planning office. The TIP will be adopted by the Board of Transportation in July 2001. At this time the projects listed in the TIP will have funding allotted to them.



Rank how a road's ability to carry traffic should be increased.

Survey 2

Q2a: Improvements to Intersections ?

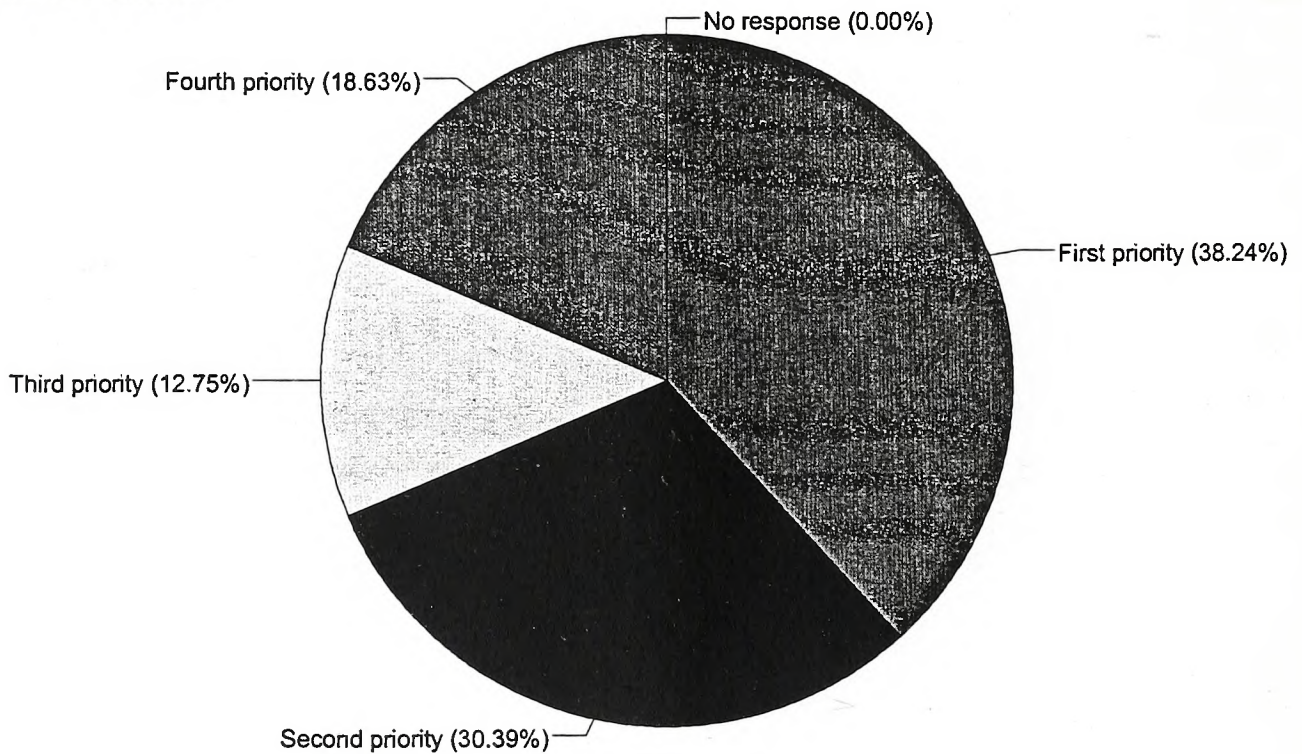




Rank how a road's ability to carry traffic should be increased:

## Survey 2

### Q2b: Building More Travel Lanes ?

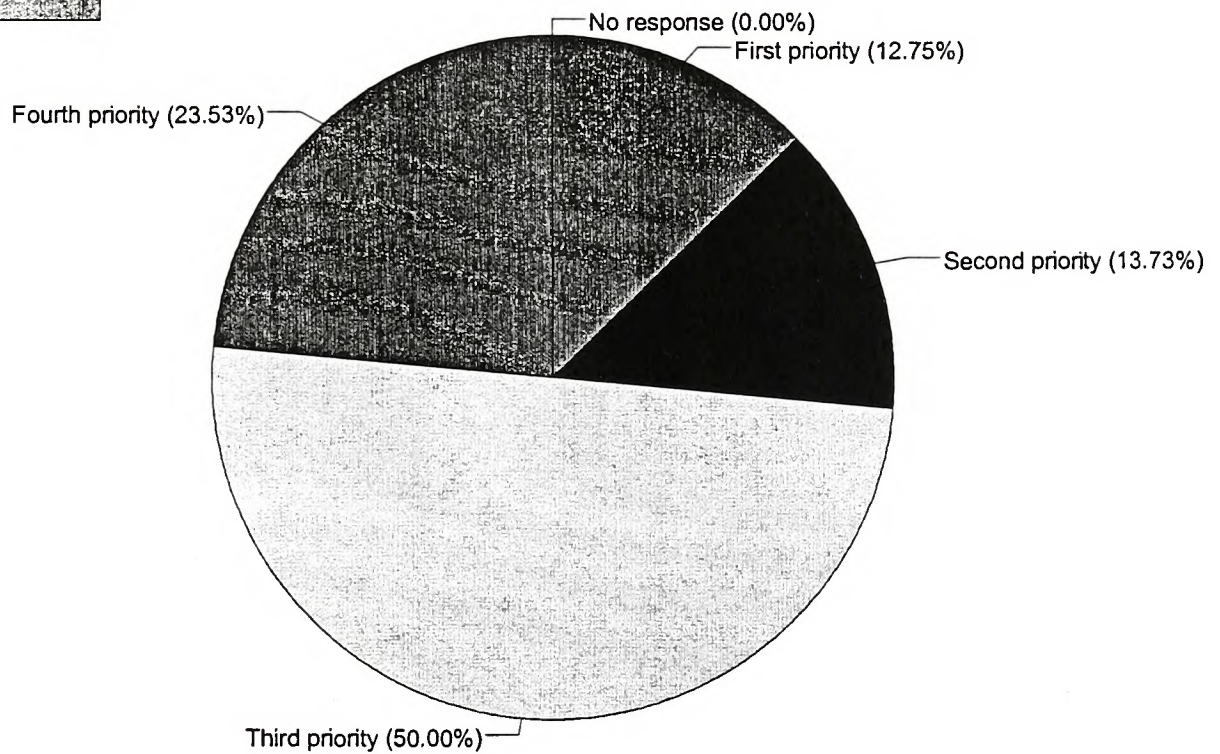




Rank how a road's ability to carry traffic should be increased:

Survey 2

### Q2c: Controlling Strip Development ?

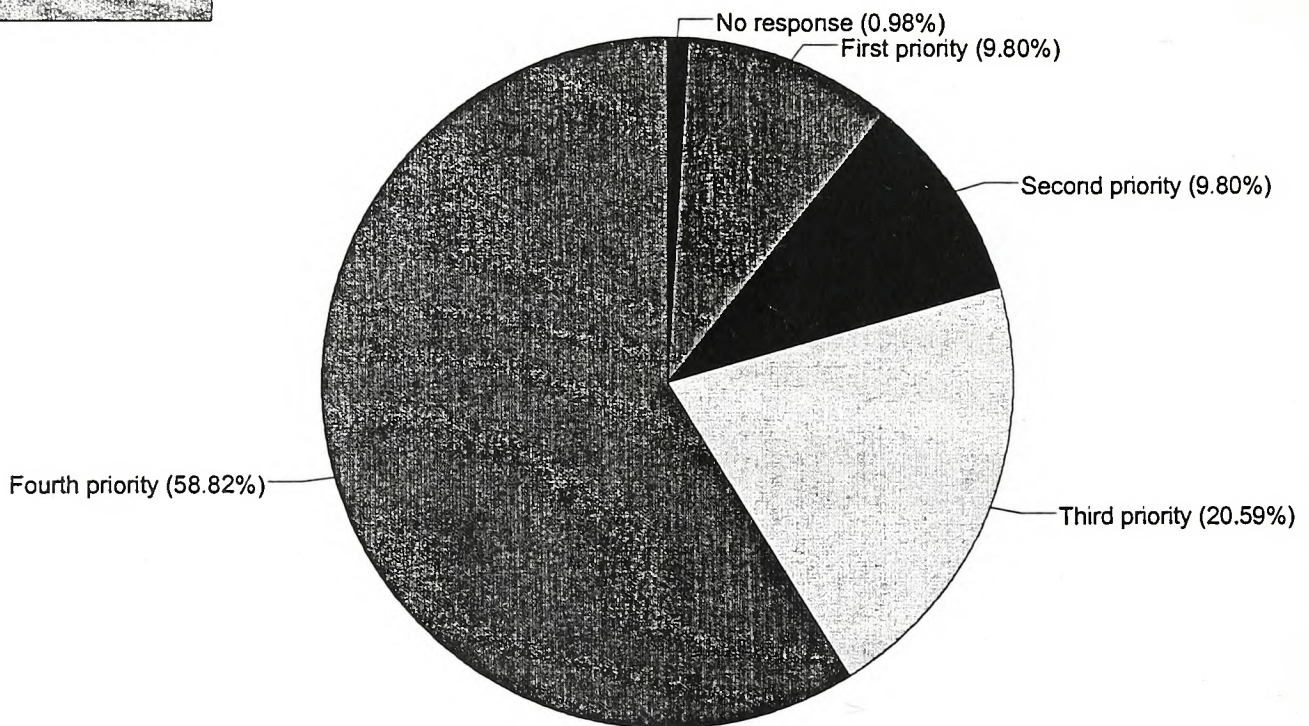




Rank how a road's ability to carry traffic should be increased:

Survey 2

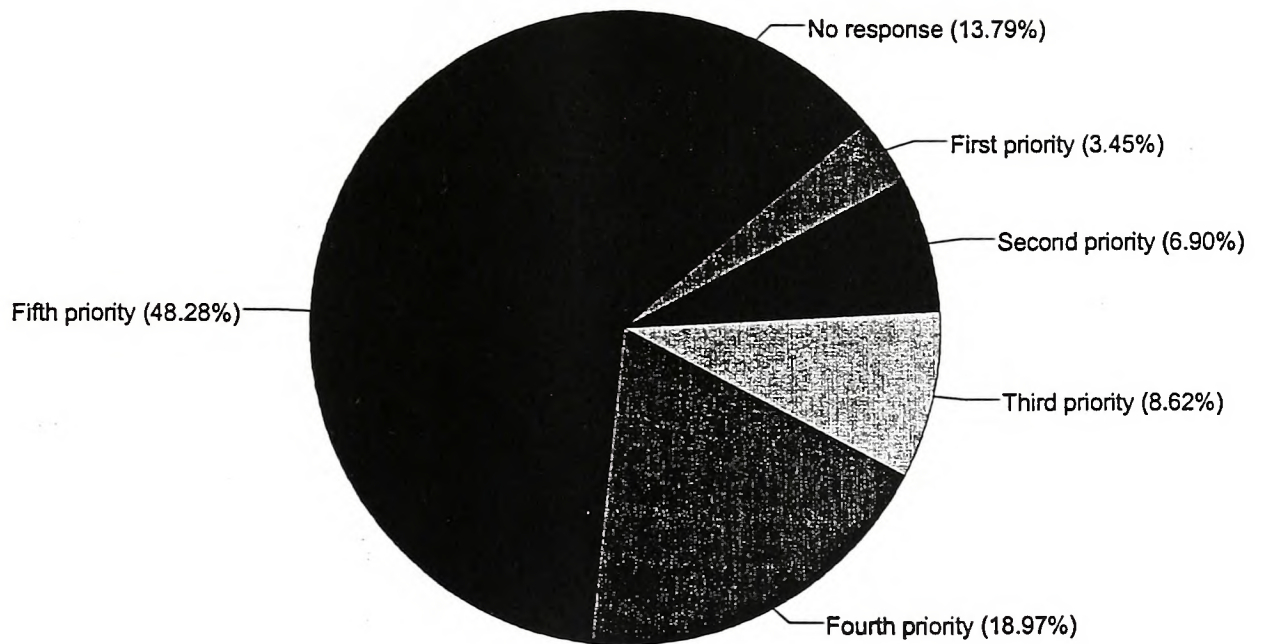
Q2d: Car Pooling  
Public Transportation ?





Rank how a road's ability to carry traffic should be increased

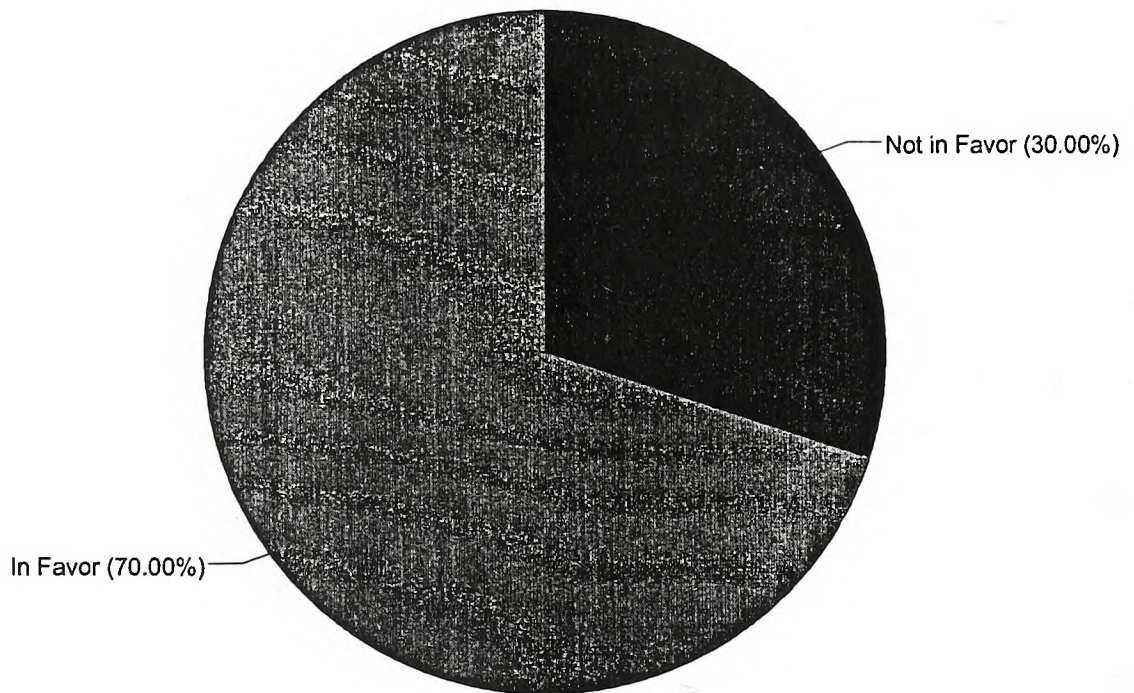
Q2e: Alternative Modes of Travel ?  
(pedestrian and bicycle paths)





If a two lane road in Johnston County is congested (crowded by vehicles), what would you like to see done to improve the traffic conditions ?

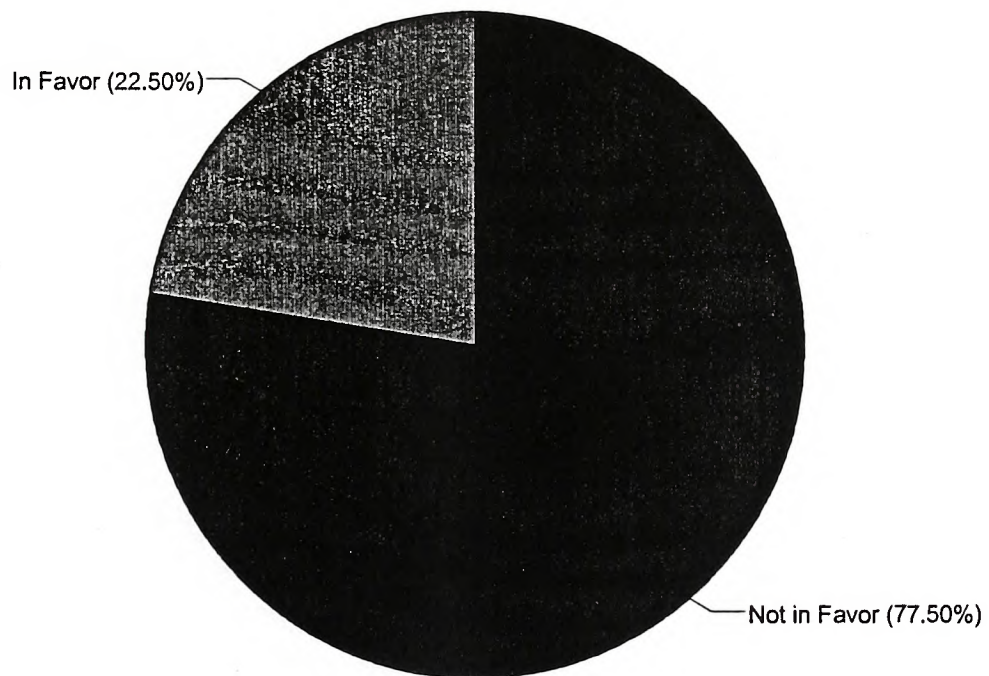
Q3a: Add More Lanes ?





If a two lane road in Johnston County is congested (crowded by vehicles), what would you like to see done to improve the traffic conditions?

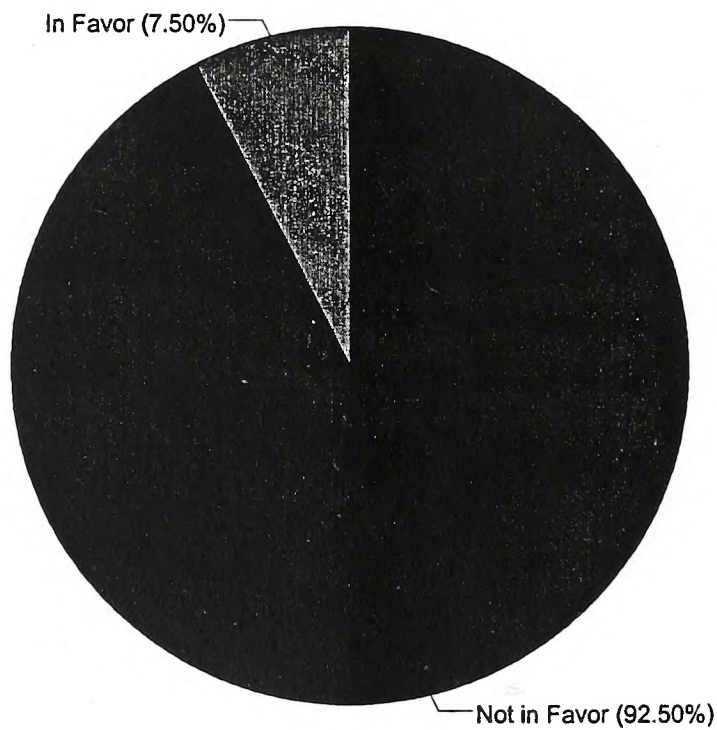
Q3b: Construct a New Road ?





If a two lane road in Johnston County is congested (crowded by vehicles), what would you like to see done to improve the traffic conditions?

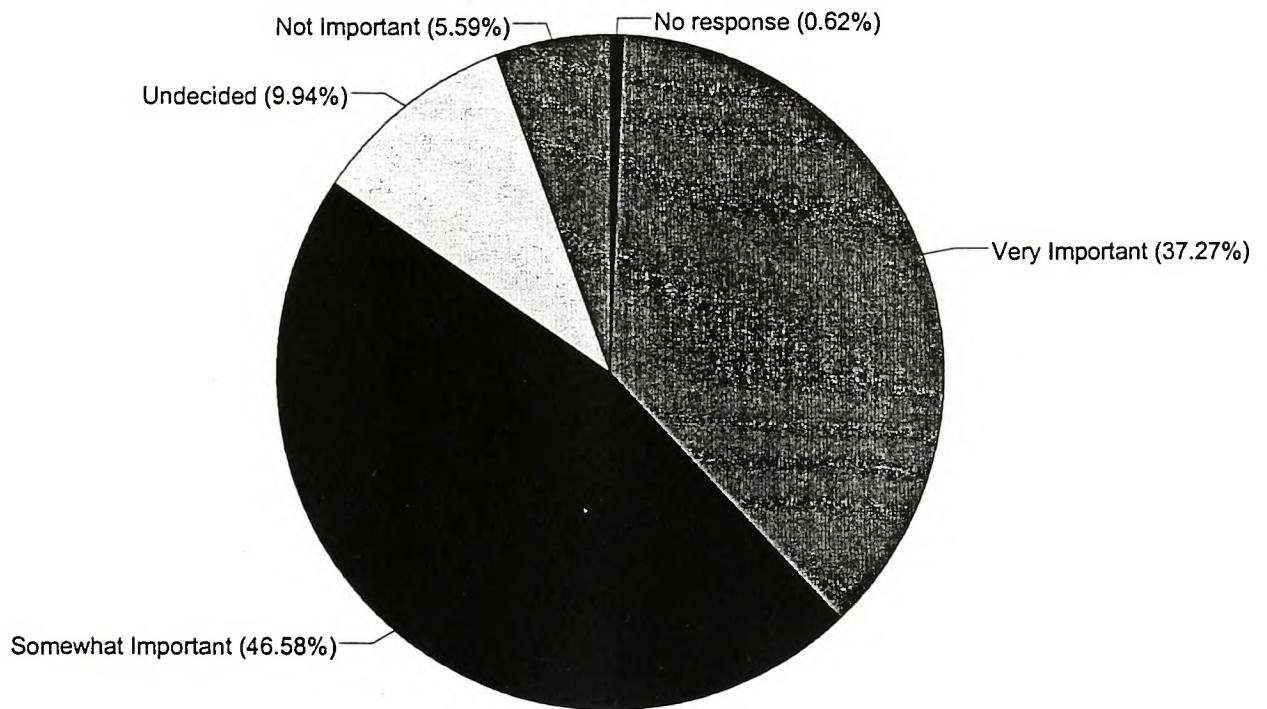
Q3c: Do Nothing, Put up with Traffic?





Indicate the importance of each topic:

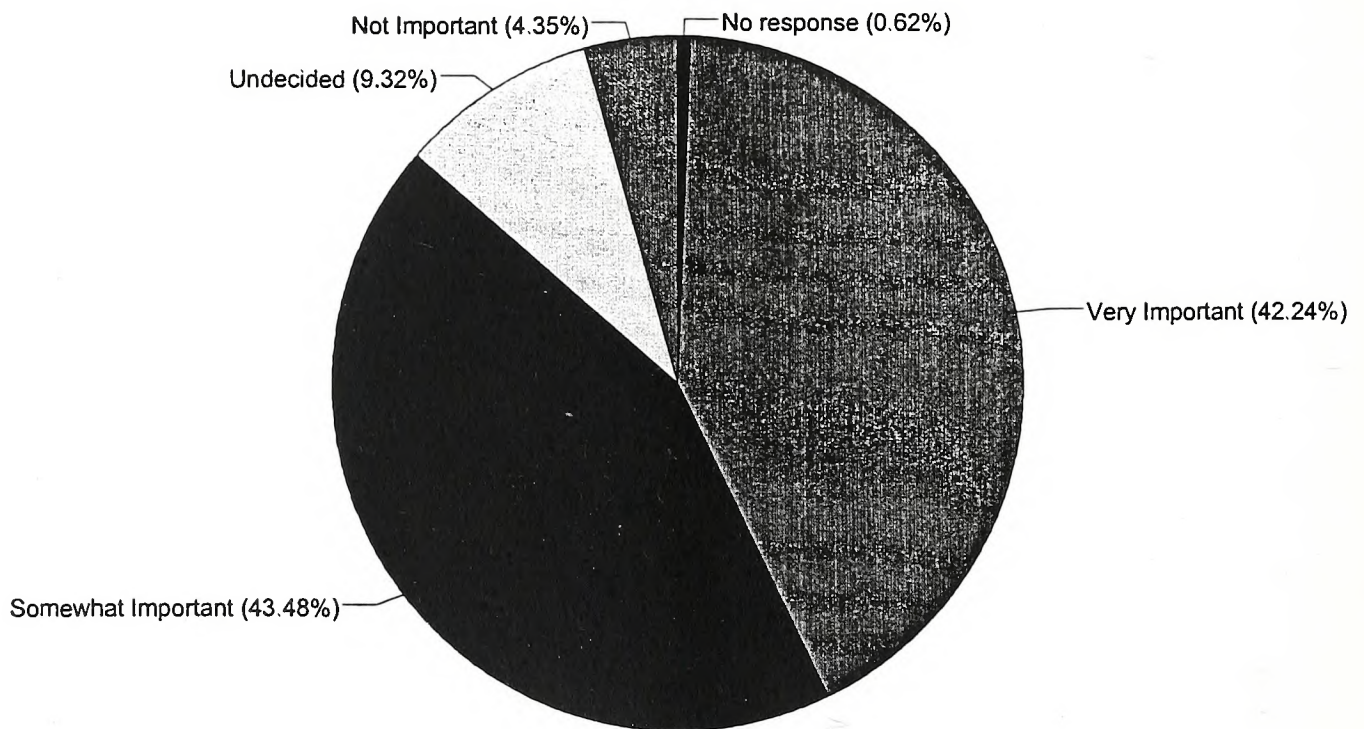
Q4a: Reduce Air / Noise Pollution ?





Indicate the importance of each topic:

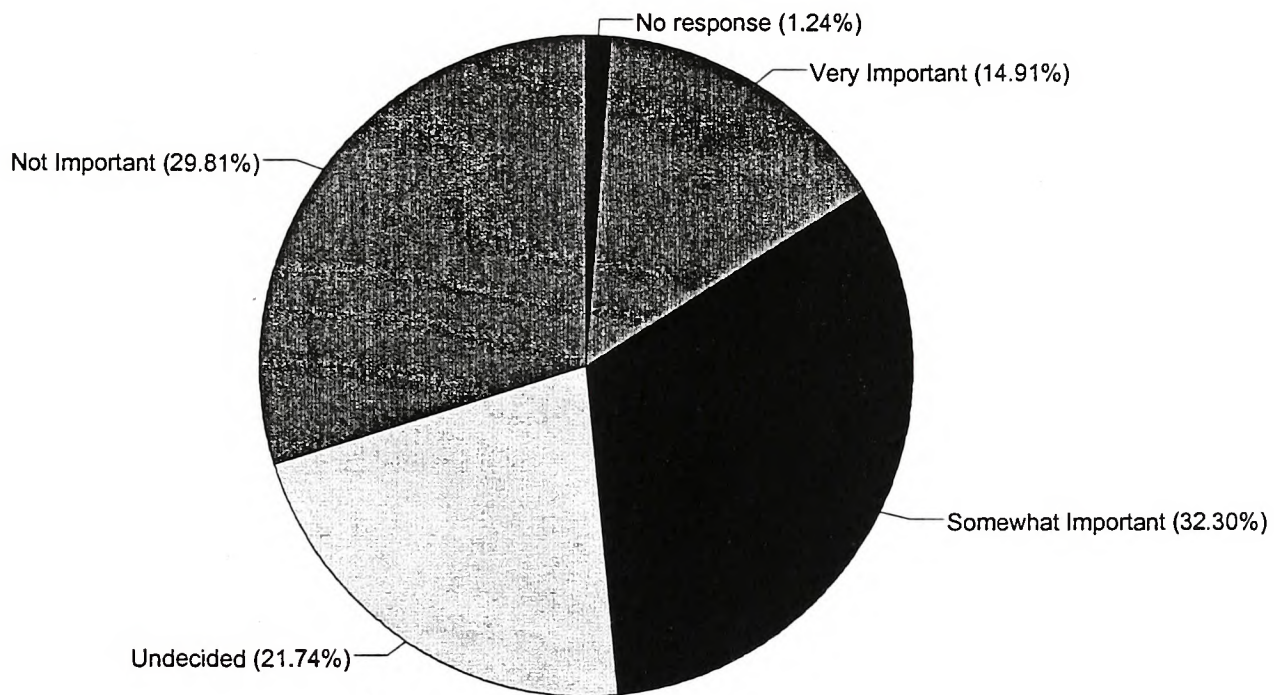
### Q4b: Environmental Impact ?





Indicate the importance of each topic:

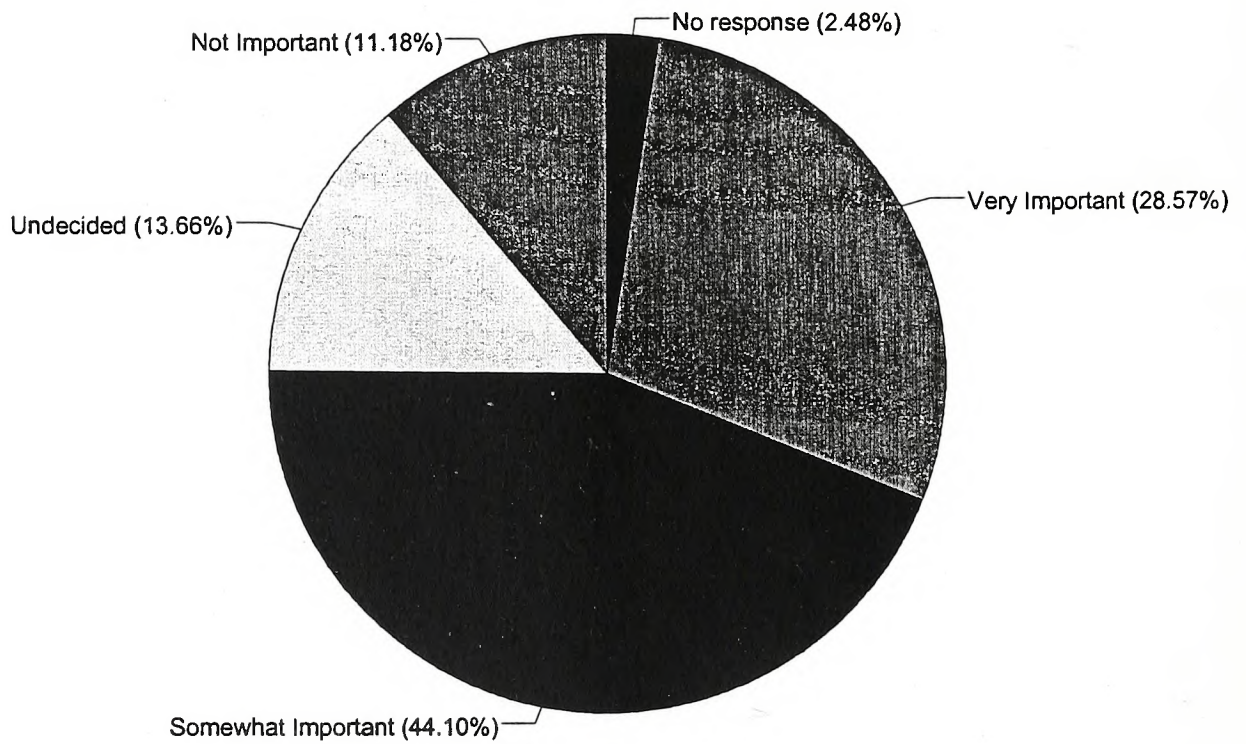
#### Q4c: Bicycle Routes / Lanes ?





Indicate the importance of each topic.

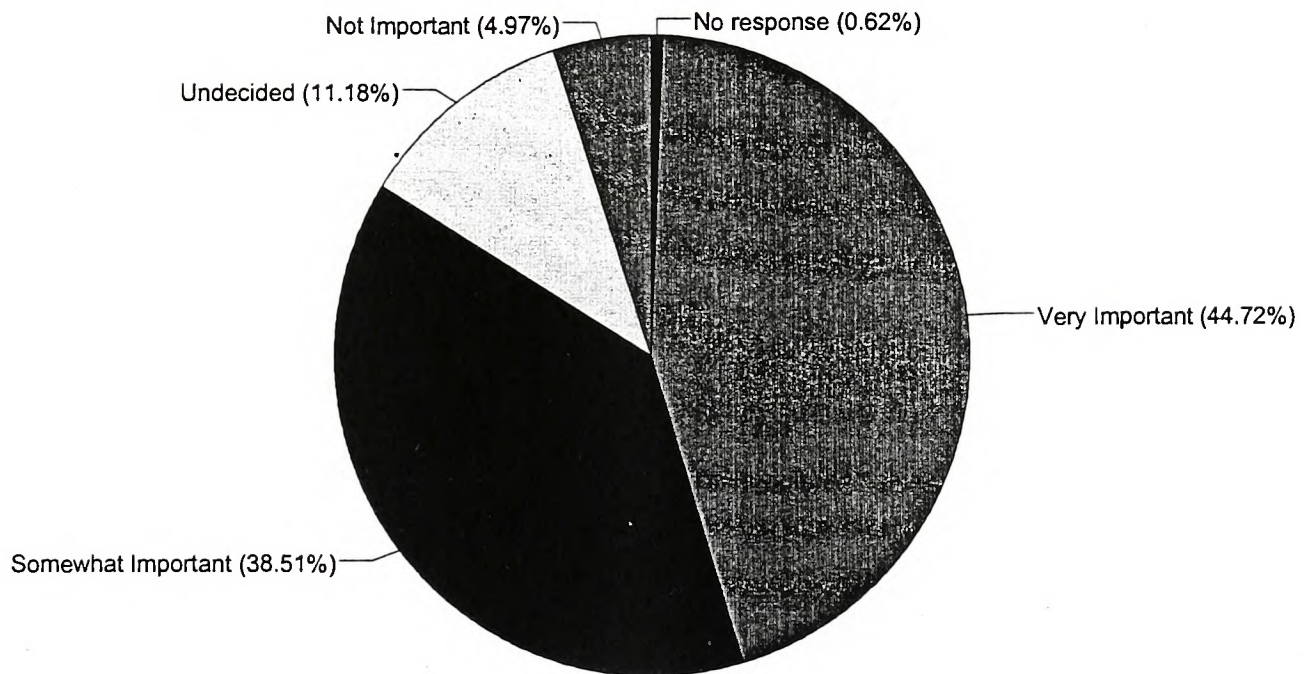
#### Q4d: Sidewalks and Greenways ?





Indicate the importance of each topic

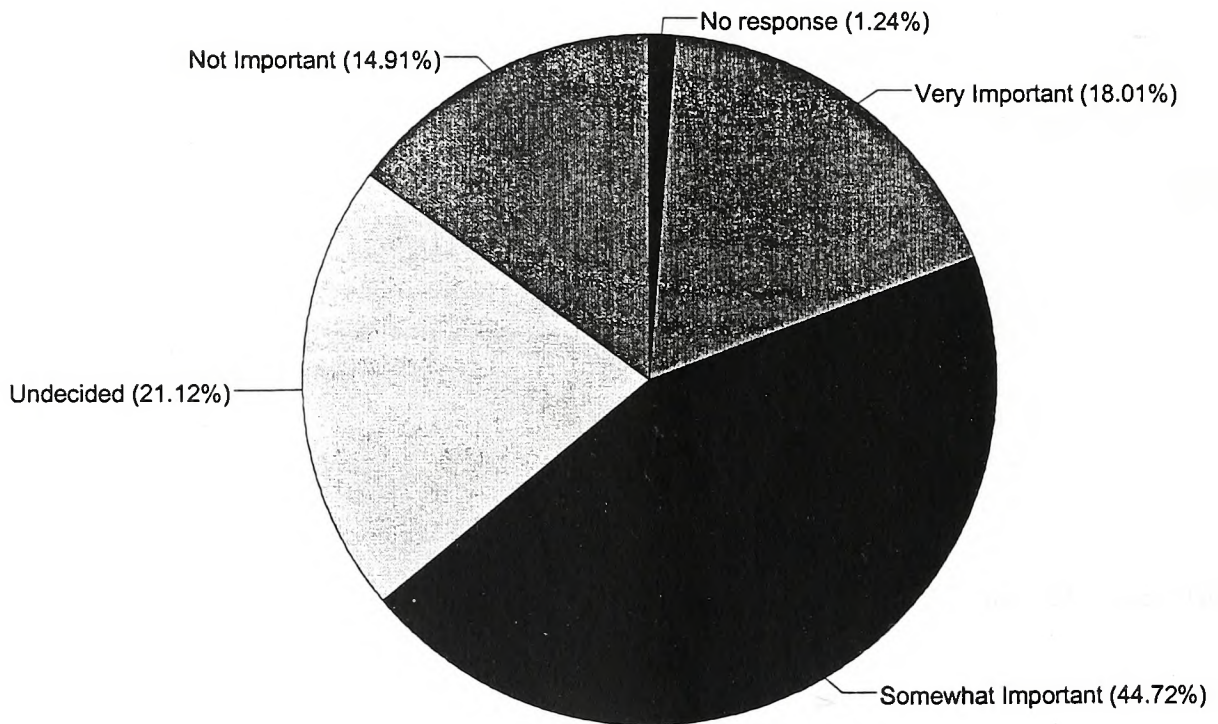
#### Q4e: Protecting Open, Natural Areas ?





Indicate the importance of each topic:

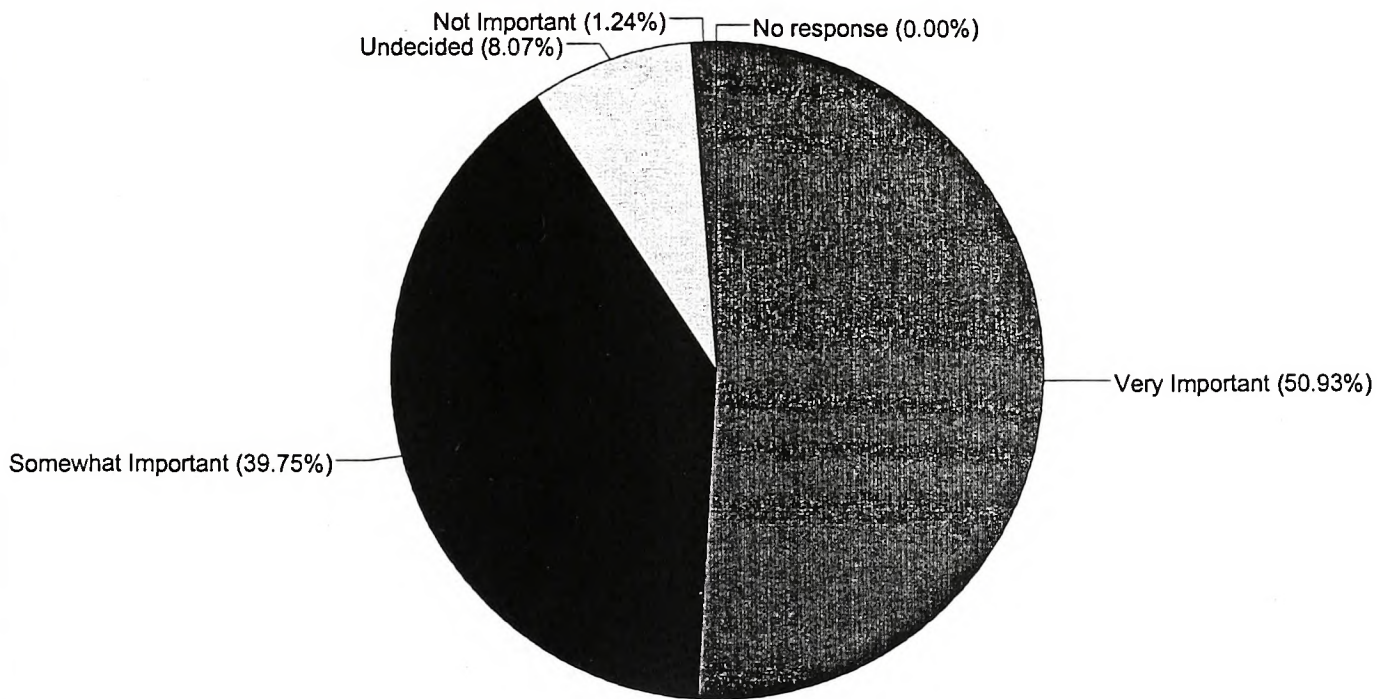
#### Q4f: Preserve Land for Future Roads ?





Indicate the importance of each topic:

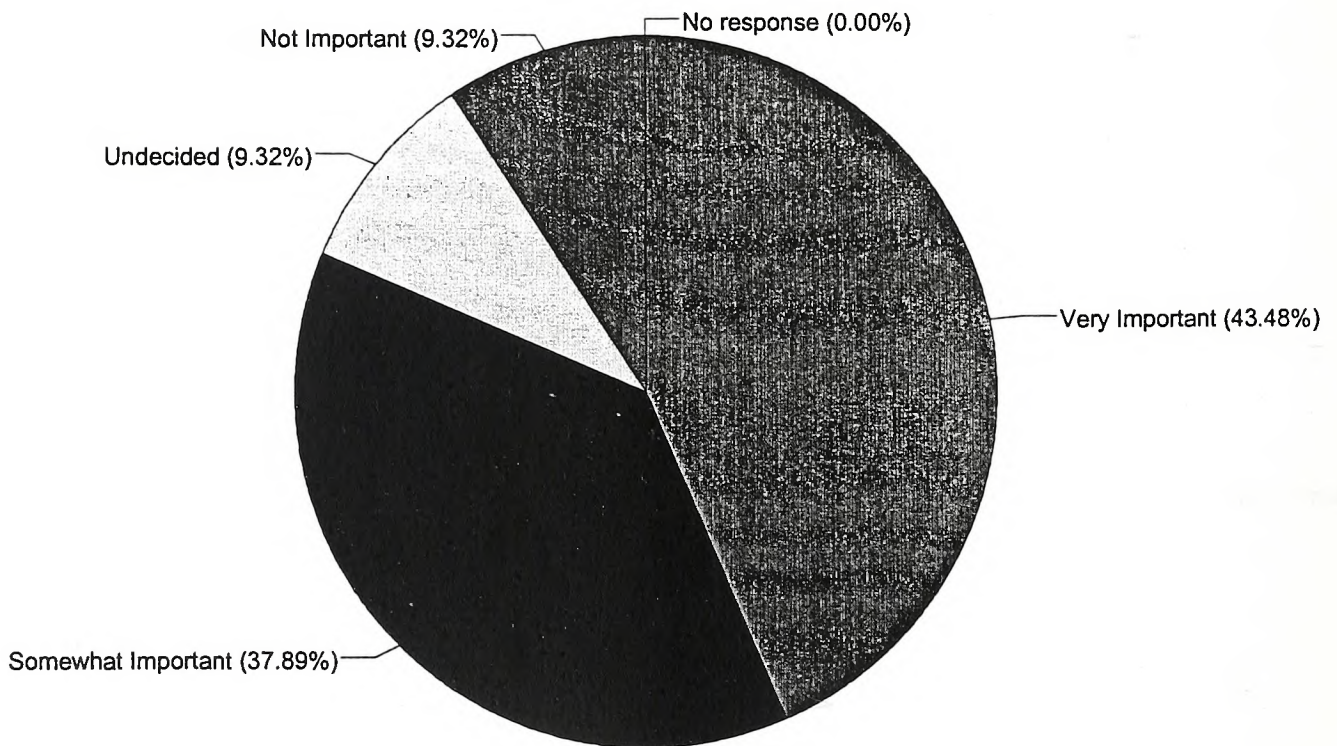
#### Q4g: Protecting Homes / Industry ?





Indicate the importance of each topic:

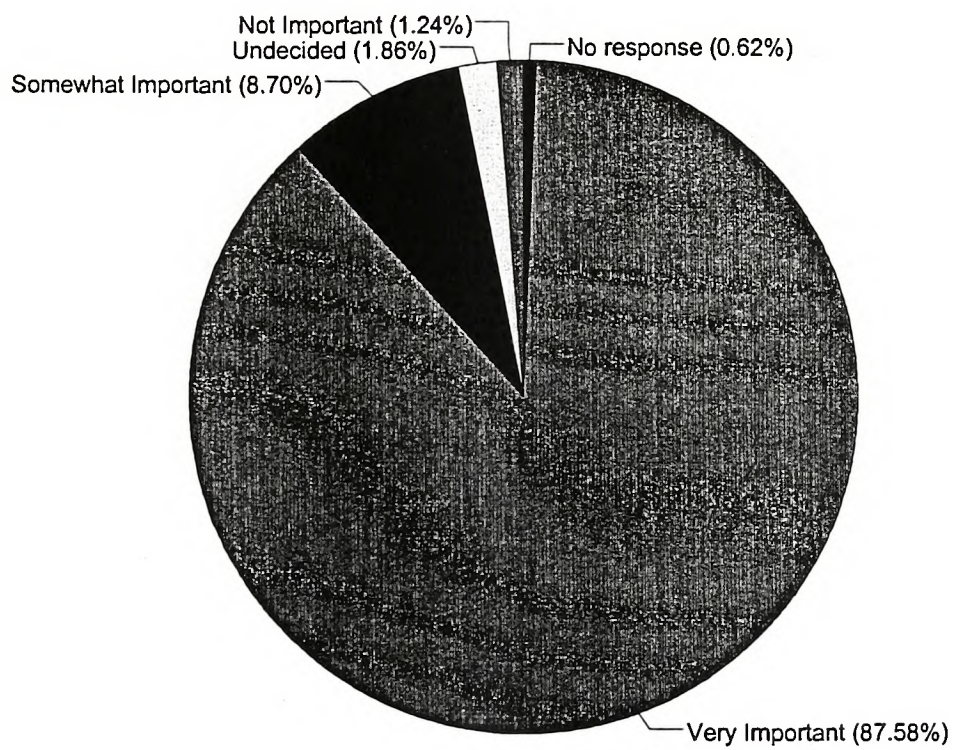
Q4h: Develop New Roads  
To Relieve Congestion ?





Indicate the importance of each topic:

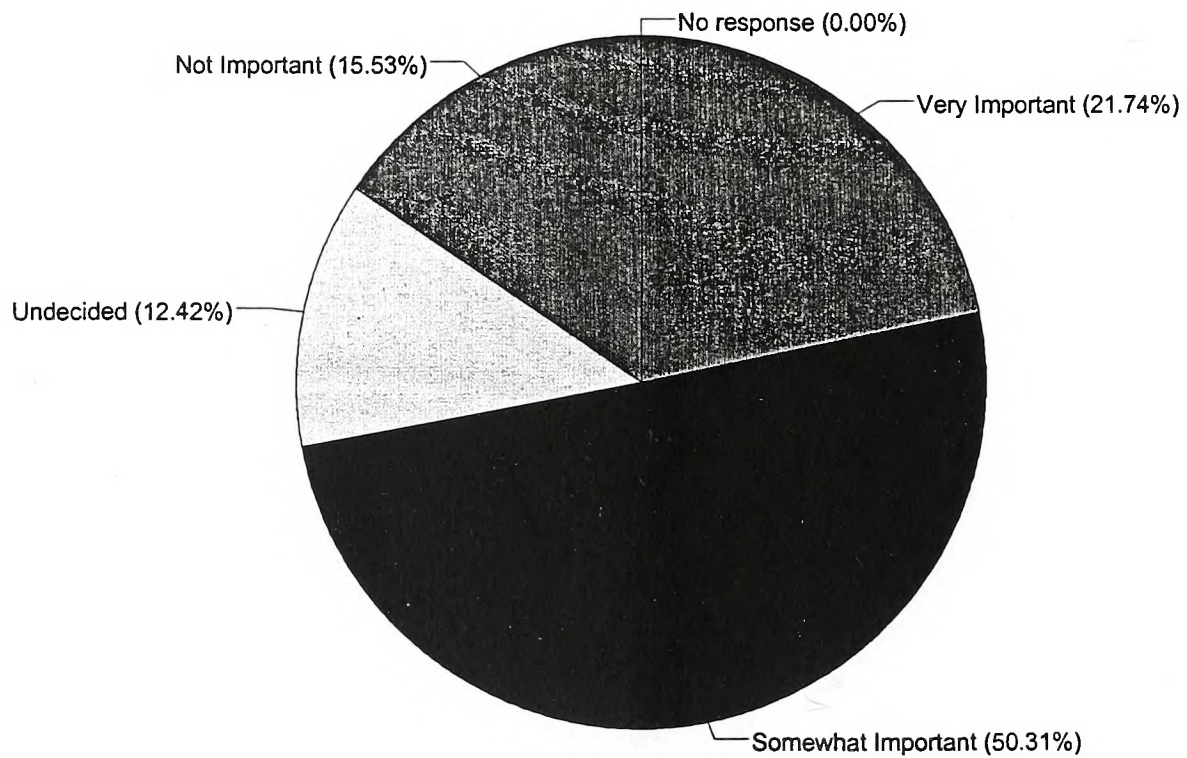
#### Q4i: Reducing Accidents ?





Indicate the importance of each topic:

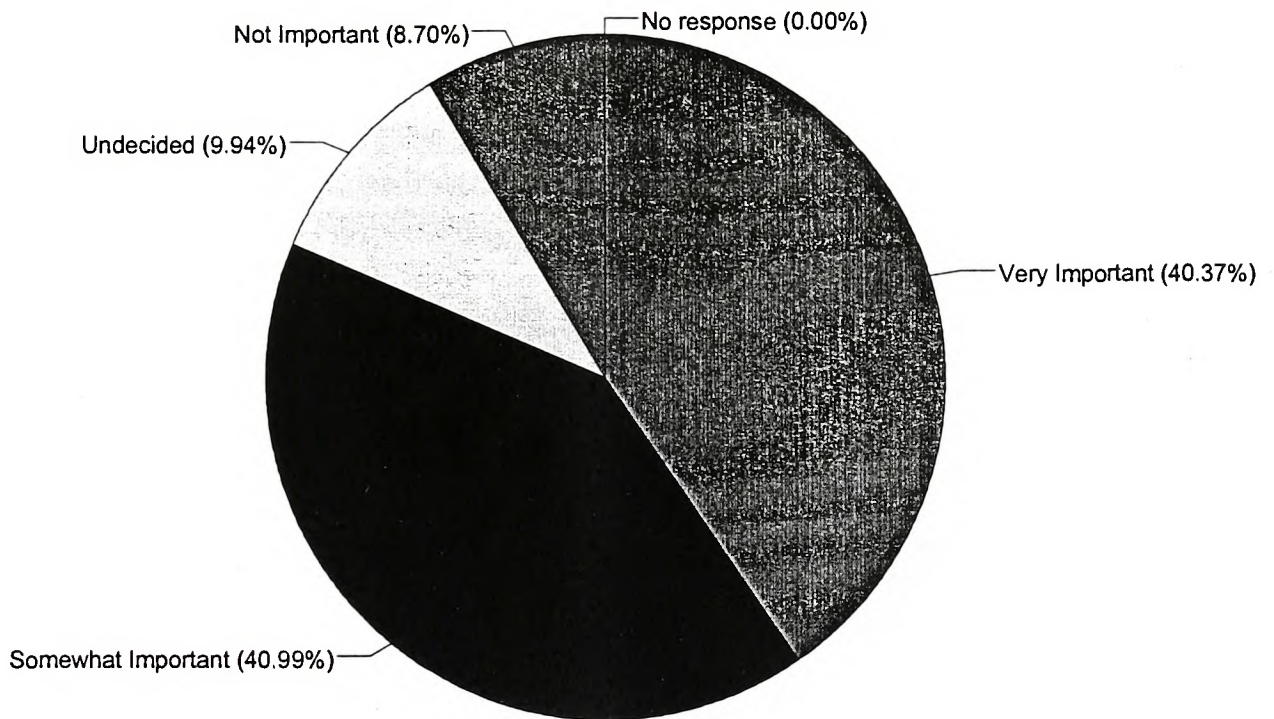
#### Q4j: Access to Shopping Centers ?





Indicate the importance of each topic:

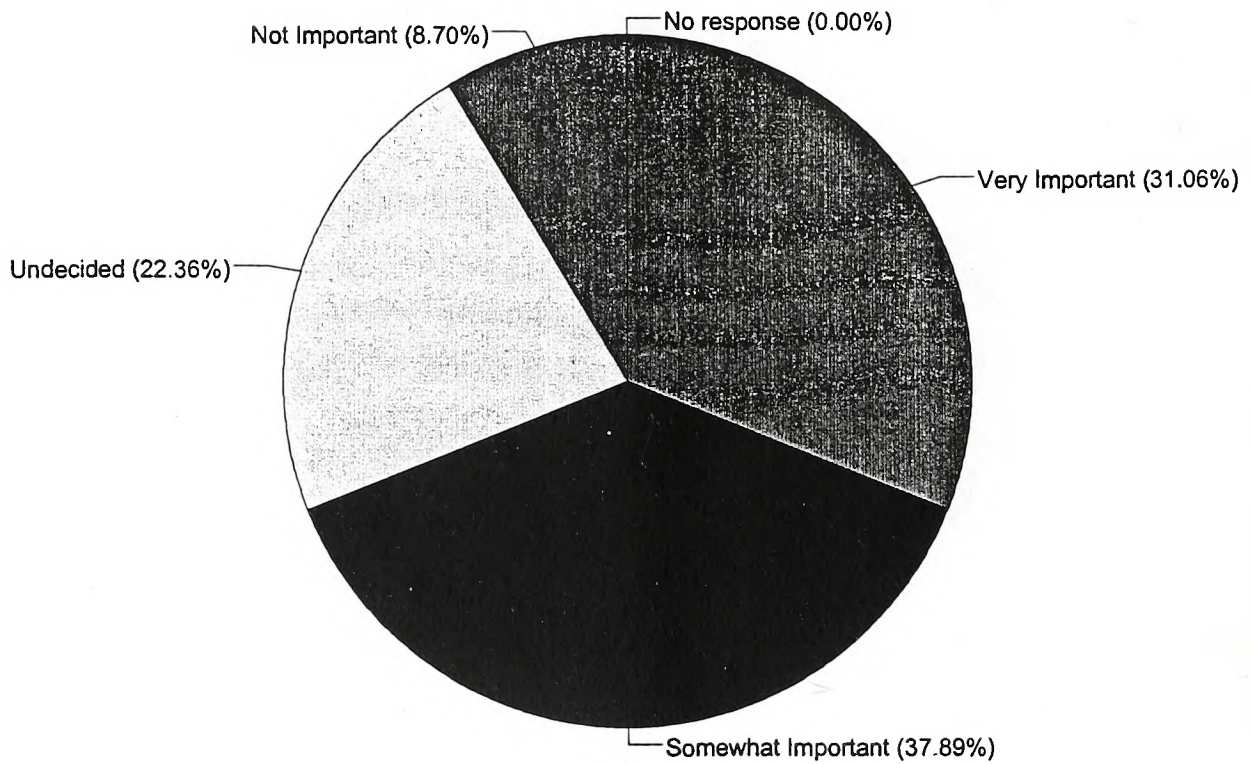
### Q4k: Travel Time ?





Indicate the importance of each topic.

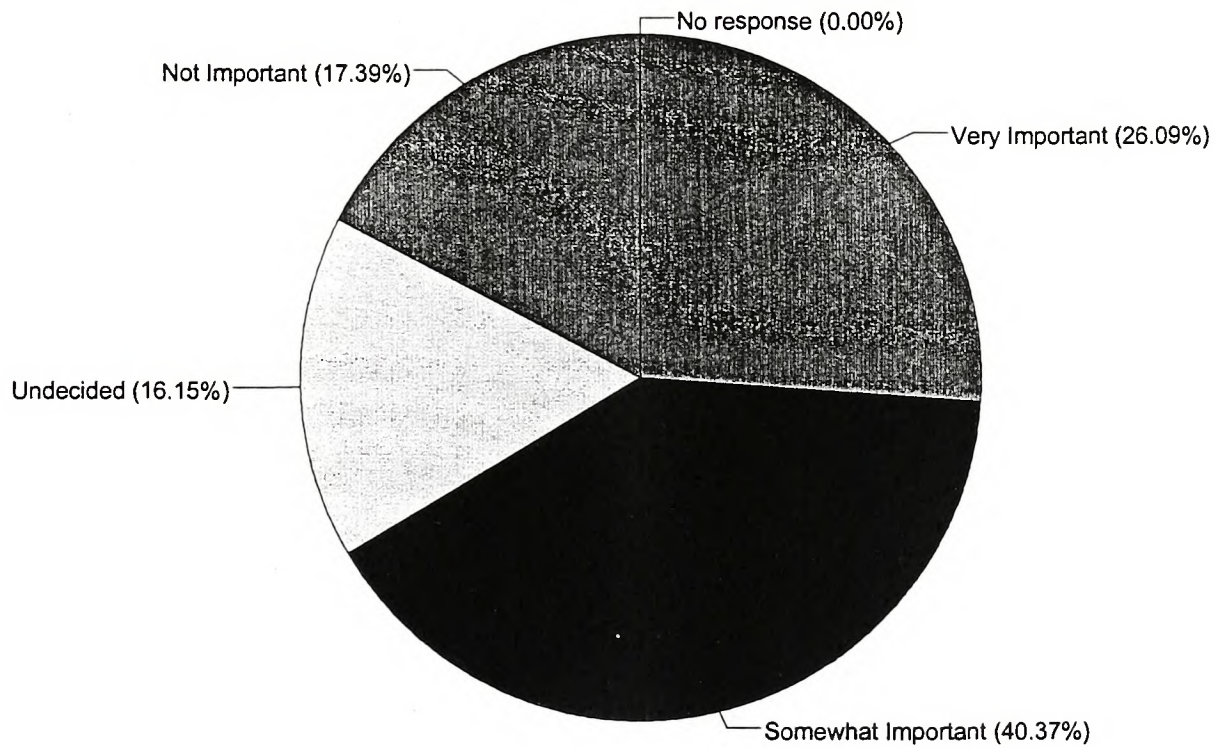
#### Q4L: Limiting The Number of Commercial Driveways Along Roads ?





Indicate the importance of each topic:

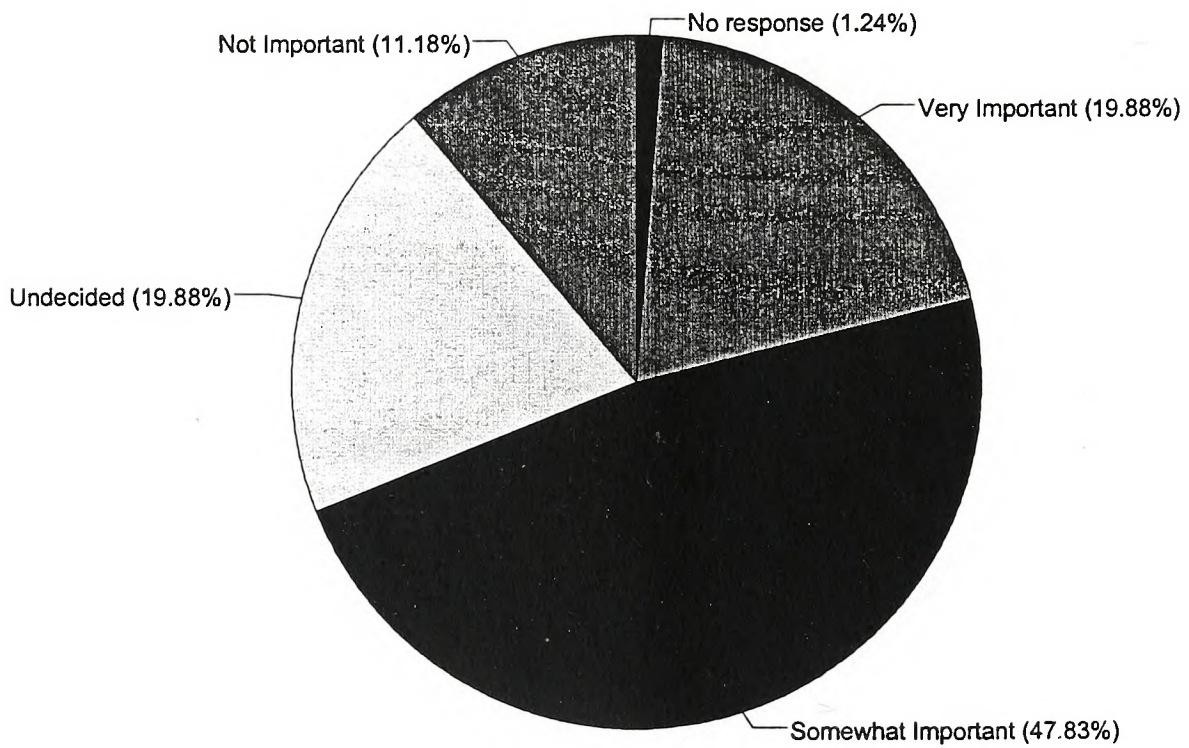
Q4m: Improve Roads to Attract  
Industry ?





Indicate the importance of each topic:

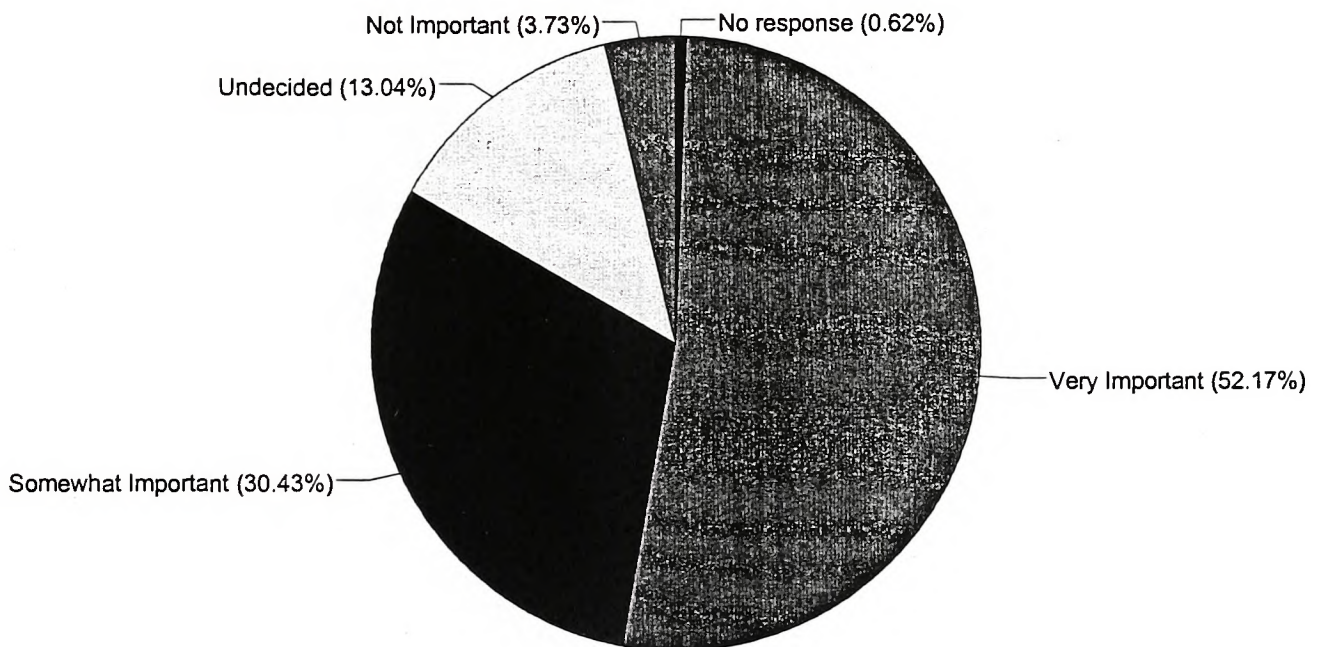
#### Q4n: Connecting Existing Streets ?





Indicate the importance of each topic:

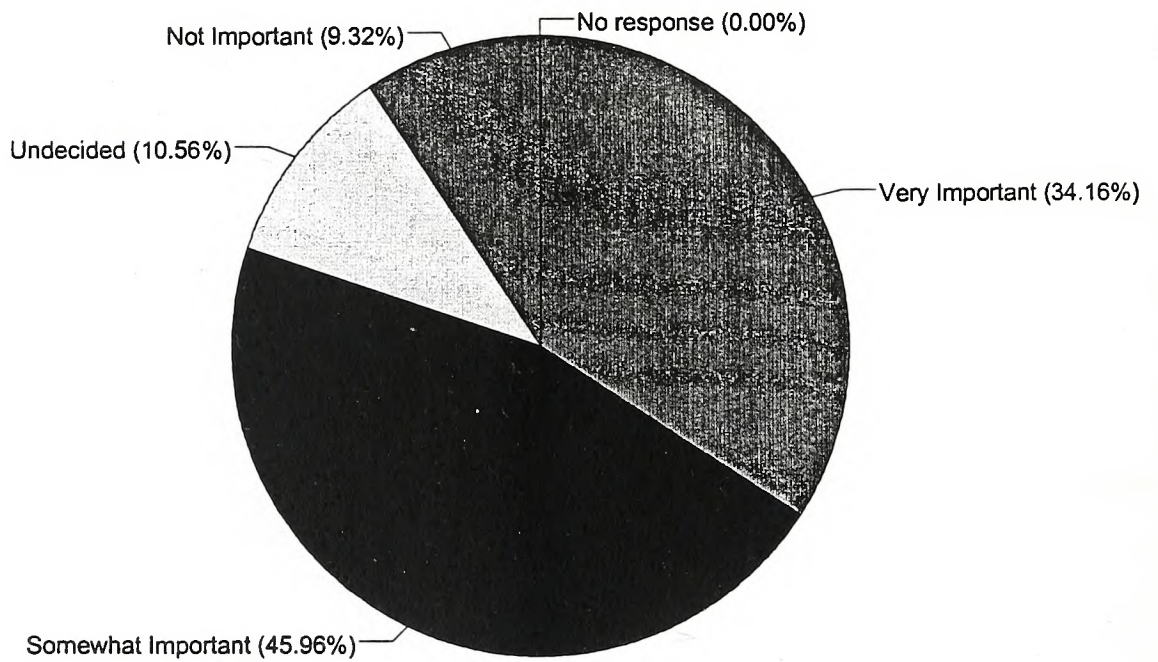
Q4o: Minimize Highway Construction  
Costs ?





Indicate the importance of each topic:

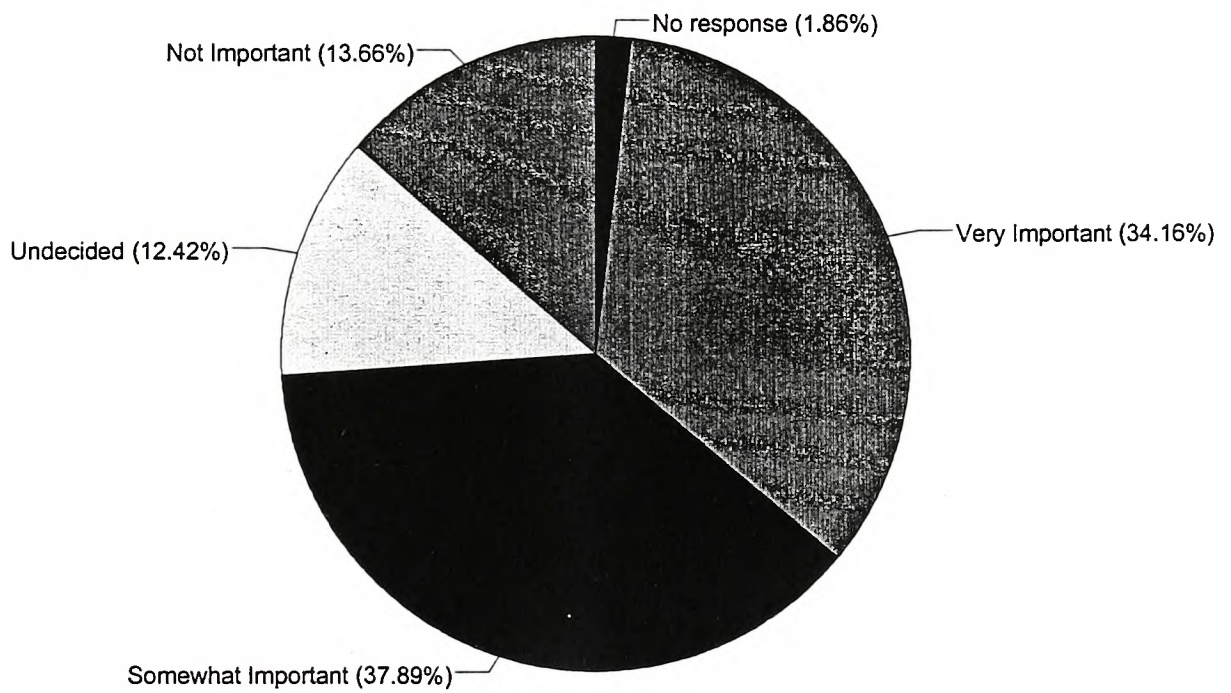
Q4p: Increase Roads Widths For  
More Comfortable Travel ?





Indicate the importance of each topic:

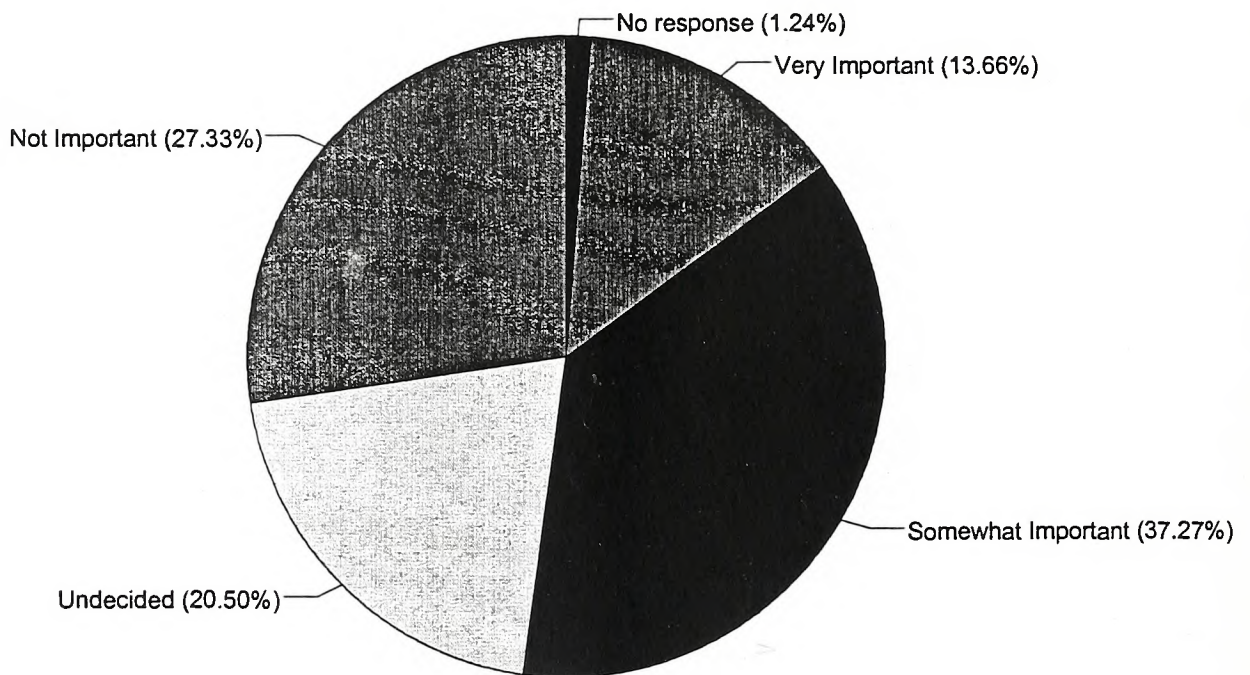
### Q4Q: Pave Existing Soil Roads ?





Indicate the importance of each topic:

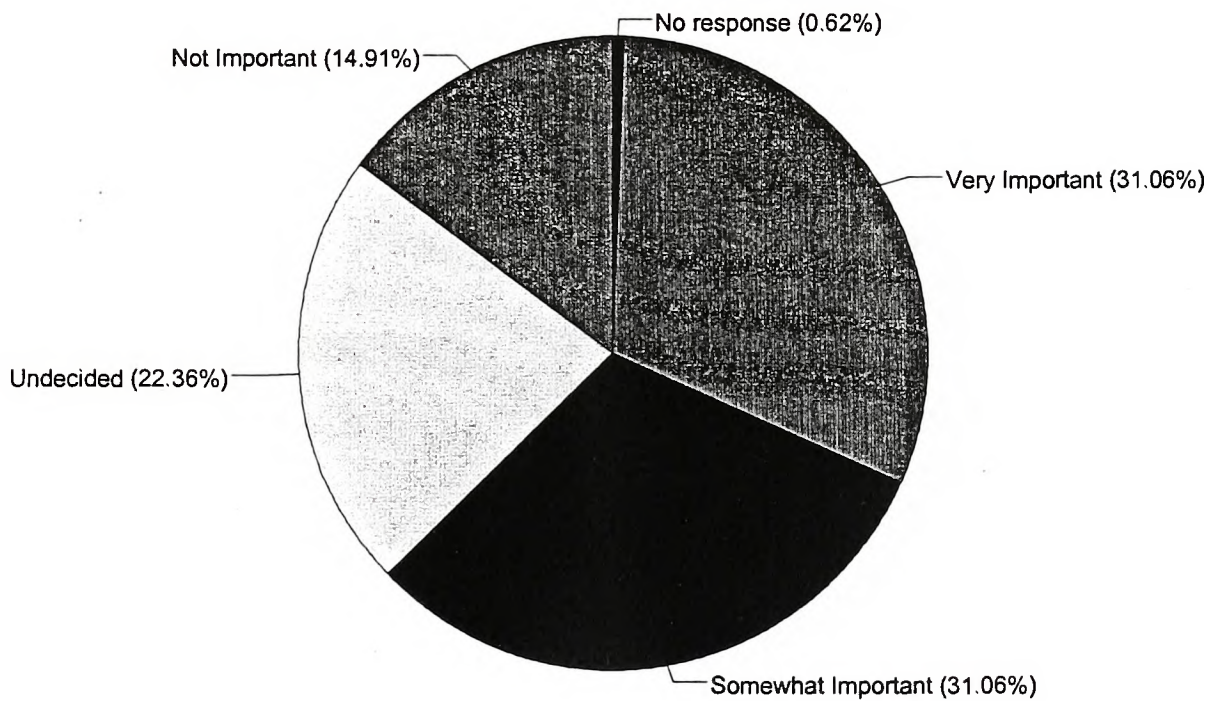
Q4r: Providing Multiple Entrances /  
Exits into Neighborhoods ?





Indicate the importance of each topic:

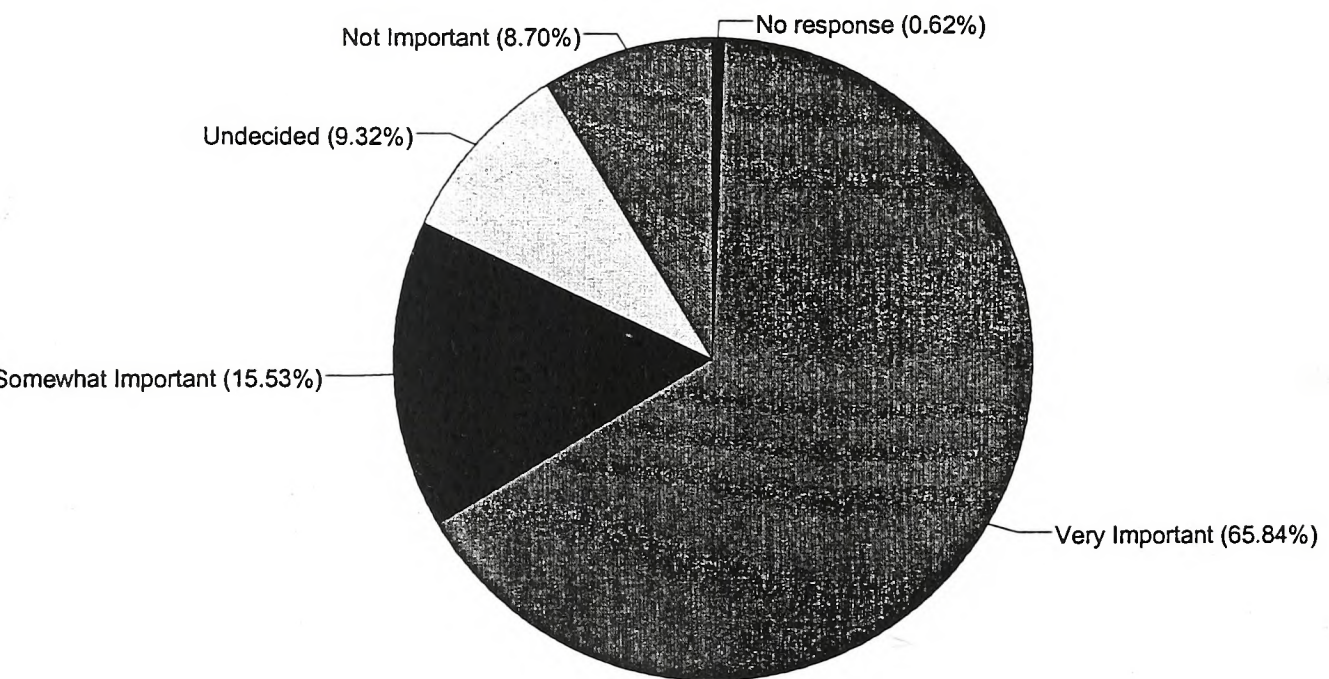
Q4s: Adding More Traffic Signals  
to Existing Roads ?





Indicate the importance of each topic:

#### Q4t: Decreasing Travel Time to Schools ?



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